5 Periphery Effects and the Dynamics of Tree Growth

Ruth Kempson, Jieun Kiaer, and Ronnie Cann

King's College London and Edinburgh

1. PRELIMINARIES

It has often been observed that the discontinuous dependency effects displayed between left-peripheral expressions and the position from which their interpretation has to be computed may display complex interactions between word order, structural constraints, and anaphora that belie any neat bifurcation between movement on the one hand, and base generation with anaphoric dependency on the other hand (see de Cat 2004; Shaer, this volume). The problem is that these phenomena may display some of the properties taken to be diagnostic of a non-movement analysis (the occurrence of an explicit pronominal), and at the same time some of the properties diagnostic of movement (sensitivity to strong island restrictions). The so-called clitic left dislocation phenomenon of Greek and the Romance languages with a left-peripheral NP optionally clitic-doubled is perhaps the most familiar (see Anagnostopoulou 1997), with sensitivity to strong islands depending on case specification: No dependency is possible across a relative clause boundary with a case-matched clitic, but the dependency is permitted if the left-peripheral NP is nominative[1]:

(1) Ti Maria (ti) sinantisa xtes [Greek]
the-ACC Maria (her) I-met yesterday.'
'Mary, I met (her) yesterday.'

(2) *Ti Maria, xtes sinantisa ton andra pu tin
the-ACC Maria yesterday I-met the man who her-ACC
patreftike
married
'Mary, yesterday I met the man who married her.'

(3) I Maria, xtes sinantisa ton andra pu tin
the-NOM Maria yesterday I-met the man that her-ACC
patreftike
married
'Mary, yesterday I met the man that married her.'

This and other left-periphery effects in the so-called head-initial languages have received a great deal of attention (Rizzi 1997 and many others: see Anagnostopoulou et al. 1997). Rather less attention has been paid to interaction of anaphora and structural constraints at the right periphery of a sentential sequence (see Beerman et al. 1997), where a range of rather different effects are displayed—among them expletive phenomena with co-dependence of expletive and postposed clausal associate,[2] and backgrounding topic effects where a pronoun within the clausal sequence has a co-referring expression at the right periphery, a root phenomenon, like hanging topic left dislocation:

(4) It's likely that we are wrong.

(5) She's a nuisance, that woman.

The puzzle about right-periphery effects is that they are in part the mirror-image of those on the left periphery: A right-peripheral constituent is doubled by a pronominal within the clause. Like left-periphery effects, these cover two rather different kinds of case. One is sensitive to structural constraints, for example, the pairing of an expletive pronoun with its postposed clausal associate, as in (4). The other is not sensitive to such constraints but merely involves doubling some clause-internal pronoun by a right-placed noun phrase. In such cases, like hanging topic phenomena, the dependency between the right-dislocated expression and its co-referential pronoun may apparently fail to observe island constraints:

(6) The price they've put on it is outrageous, that vase over there in the corner.

However, such right-periphery effects are in part unlike left-periphery effects. Even in the non-structurally restricted cases of left- and right-periphery doubling, the interpretive effect is rather different in the two cases, in that right dislocation in (5)–(6) gives rise to a backgrounding topic effect, whereas left dislocation as in (3) sets out the context in which the rest of the clause is interpreted, allowing for contrastive (and other) topic effects. And in the structurally restricted cases, dislocation at the right periphery does not allow any discontinuity rightwards across a clause boundary.[3] This is the Right Roof Constraint (Ross 1967), which ensures that (7) has no interpretation in which the clausal string at some right-peripheral position can be used to reconstruct a doubly embedded sentential subject to yield the interpretation 'That it is likely that we are wrong is unfortunate':

(7) *It's likely is unfortunate that we are wrong

This asymmetry is quite unexpected for most frameworks, given the articulation of structure exclusively in terms of configurational hierarchy. This, however, is only the beginning of the puzzle, as with verb-final languages there appears to be a further process or rather set of processes called scrambling, which, despite involving permutation of expressions without needing explicit anaphoric expressions to identify the site of their construal, nevertheless does not coincide with either long-distance dependency or A-chain phenomena. Scrambling phenomena have in consequence been said to be distinct from both (Saito 1992 and others following: see Karimi 2003), necessitating two further processes: local scrambling, which yields free local word-order variation, (8)–(9); and long-distance scrambling, (10), which in some languages may apparently apply to more than one expression, yielding so-called multiple long-distance scrambling:

(8) Jina-ka sakwa-rul mek-ess-ta [Korean]
Jina-NOM apple-ACC eat-PAST-DECL
'Jina ate an apple.'

(9) Sakwa-rul Jina-ka mek-ess-ta
apple-ACC Jina-NOM eat-PAST-DECL
'Jina ate an apple.'

(10) Sakwa-rul Mina-ka Jina-ka mekessta-ko malhayssta
apple-ACC Mina-NOM Jina-NOM ate-COMP said
'The apple, Mina said that Jina ate.'
'Jina said that Mina ate an apple.'

(10) displays both forms of long-distance scrambling, having one interpretation in which just the object-marked NP is construed as contributing to the complement structure, and one interpretation in which the object-marked and the subject-marked NP together at the left periphery are taken to contribute to the complement structure. Intonational boundaries, and stress, are very generally used to distinguish these interpretations; indeed serious garden-path effects arise if the intonation is misleadingly assigned. Omitting languages displaying scrambling from a general typology of peripheral effects is demonstrably unsatisfactory, and in this chapter, we seek to use the tools of dynamic syntax to integrate explanations of such various left- and right-periphery effects within a general processing perspective.[4]

2. THE DYNAMIC SYNTAX BACKGROUND

What the dynamic syntax (henceforth DS) model seeks to reflect is the stepwise way in which interpretation is built up during a parse sequence. It does

so by defining a mapping from words, which define sets of parsing actions, onto progressively enriched representations of content, until a fixed (in part, contextually established) interpretation is constructed. What is distinctive about this framework is its articulation of underspecification and processes of update as intrinsic to the structural explanation of language. The growth process is taken as the basis of syntactic explanation: A sentence is defined to be well-formed just in case there is at least one possible route through that process.

Interpretation in this framework is articulated as a semantically transparent tree structure, in which a logical formula decorates the top node, and the various sub-terms of that formula decorate the nodes it dominates. Individual nodes are decorated either with *Formula* (*Fo*) and *Type* (*Ty*) values, or with *requirements* for such values. For example, decorations on nodes such as *?Ty(t)*, *?Ty(e)*, *?Ty(e → t)* etc. express requirements to construct formulae of the appropriate type on the nodes so decorated, and these drive the subsequent tree-construction process.[5]

The process of satisfying such requirements forms the dynamic basis of the framework, whereas the formal system underpinning the partial trees that are constructed is a logic of finite trees (Blackburn and Meyer-Viol 1994). There are two basic modalities, $\langle\uparrow\rangle$ and $\langle\downarrow\rangle$, such that $\langle\downarrow\rangle\alpha$ holds at a node if α holds at its daughter, and its inverse, $\langle\uparrow\rangle\alpha$, holds at a node if α holds at its mother. Function and argument relations are distinguished by defining two types of daughter relation, $\langle\downarrow_0\rangle$ for argument daughters, $\langle\downarrow_1\rangle$ for functor daughters. There is also an additional LINK operator, *L*, which relates paired trees, with a LINK relation from a node in one tree to the top node of another (see below).

As Figure 5.1 illustrates, the process of both setting out and building up interpretations for a string is defined as a serial process of tree growth following the order of words in a string. Individual steps take the parser from a single root-node of a tree, decorated with *?Ty(t)*, (a) in Figure 5.1, indicative of the requirement (the assigned goal) of establishing a formula of type *t*, finally deriving a binary branching tree with all nodes decorated with formula values, (f) in Figure 5.1. From the unique node identified as under development by the 'pointer,' $\Diamond$, these steps are determined either by general computational actions, such as anticipating a subject–predicate structure, immediately prior to (b) in Figure 5.1 or lexical actions triggered by parsing lexical items in the order in which they are presented in some string of words. There is cross-linguistic variation in the balance of computational and lexical actions. In some languages, English for example, the verb projects only predicate-internal structure, with the subject node being constructed by general computational rules. In others, especially but not exclusively pro-drop languages, the verb projects a full propositional structure, including the subject, with variation as to whether some or all of those arguments are pronominal-like in being decorated in a way that enables their identification directly from the context (see next section).

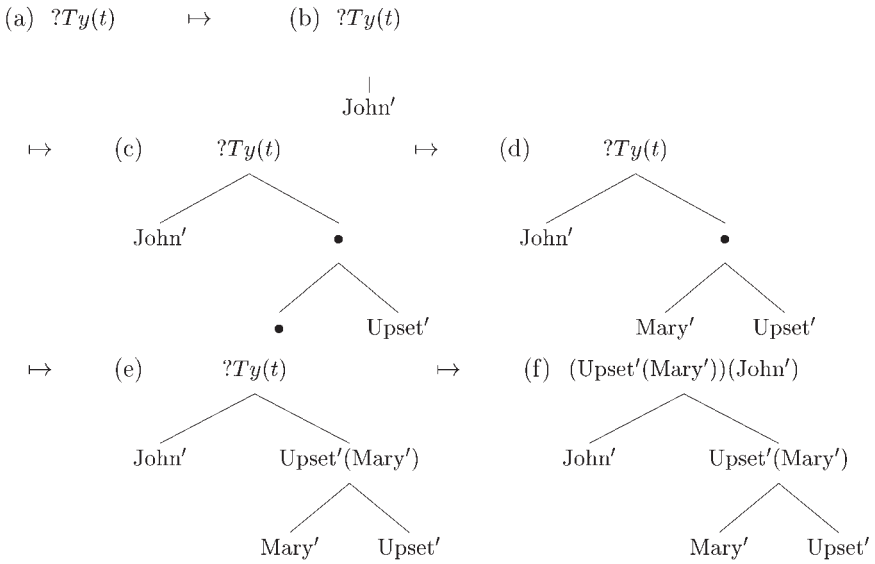

Figure 5.1 Parsing *John Upset Mary*.

2.1. Underspecification and Tree Growth

With concepts of underspecification and update of both content and structure being central to the DS framework, well-formedness is defined as the availability of at least one derivation leading to a tree with no outstanding requirements having used all the words in sequence. First, we define a concept of underspecification of content, the familiar case of context dependence, which involves lexical projection of a place-holding formula value, a *meta-variable*, to be replaced as part of the process of constructing an interpretation. Such meta-variables are projected by anaphoric and other expressions (such as verbs with pro-drop properties, which decorate their argument nodes with such place-holding variables) and take the form *Fo(**U**)*, *Fo(**V**)*, etc. An accompanying requirement, *?x.Fo(x)*, indicates that the meta-variable *must* be replaced with some specific, contentful, formula value, as otherwise the derivation will be rejected since there may be no outstanding requirements left at the end of a successful parse. Substitution may take place either through a pragmatic process of substituting some term from the context or through the construction process itself. For example, the meta-variable projected by the pronoun *she* in *she cried* uttered in the context *John upset Mary* will be substituted by the formula *Fo(Mary′)*. The final output tree thus contains no record that there was a pronoun in the input string, the interpretation being that Mary cried.

More controversially, the concept of underspecification is extended to structure, with long-distance dependency effects expressed by the construction of a node in the logical structure that does not have a specified, fixed

position within the tree at the stage in the interpretation process at which it is introduced. A rule of **Adjunction* (pronounced 'star-adjunction') introduces such an unfixed node, which does not have a fixed position in a tree, being marked as merely dominated by the top-node but not specifying the path of that dominance relation. This is achieved through the use of the underspecified modal relation, $\langle\uparrow_*\rangle Tn(0)$, where *Tn(0)* is the treenode address of the top-node[6] that signifies that a node is related through an unspecified sequence (possibly null) of mother relations ($\uparrow$) to the top-node.[7] This unfixed relation needs, at some point in the construction process, to be fully specified, thus fixing the node in the structure. Since only fixed nodes in a tree have a treenode address, unfixed nodes are associated with the requirement $?x.Tn(x)$.

As an example, consider the parse of the clitic-doubling example from Greek in (1), repeated below as (11):

(11) Ti Maria (ti) sinantisa xtes [Greek]
the-ACC Maria (her) I met yesterday

The analysis is shown schematically in Figure 5.2, where the dashed line indicates the unfixed relation of the node decorated by the left-peripheral expression *Ti Maria*. The important transitions are shown in the figure: From the initial requirement *?Ty(t)* an unfixed node is constructed (a) that is decorated with the content of *Ti Maria* (b). The verb then projects a full propositional template with a meta-variable decorating the subject node, indicating subject pro-drop (c). After substitution, the pointer moves to the internal argument node, which shows a second metavariable, this time provided by the object clitic *ti*. At this point, the unfixed node is merged with the fixed internal argument node, as shown by the dotted line (d). The fixing of the unfixed node is thus resolved at the point in movement frameworks where a gap (or resumptive pronoun) appears.[8]

Note the requirements $?x.Tn(x)$ on the unfixed node and $?x.Fo(x)$ on the fixed node decorated by the meta-variable, as provided by the clitic. These jointly drive the unification process, which resolves both requirements by fixing the unfixed node as decorating the fixed one. As Figure 5.2 displays, the node introduced as unfixed in the parsing of some left-periphery expression may be unified with the node decorated by the pronoun, in virtue of its formula decoration being richer than the metavariable place-holder decoration provided by the pronoun, a matter which we return to (Section 3.2).

2.2. Case-Marking and Local Dislocation

There is a further requirement on the unfixed node in Figure 5.2, $?\langle\uparrow 0\rangle Ty(e \rightarrow t)$, which we take as a provisional characterization of a constraint imposed by the accusative case marking on the determiner: that, wherever the node is fixed, its mother must be a predicate node. Analogously,

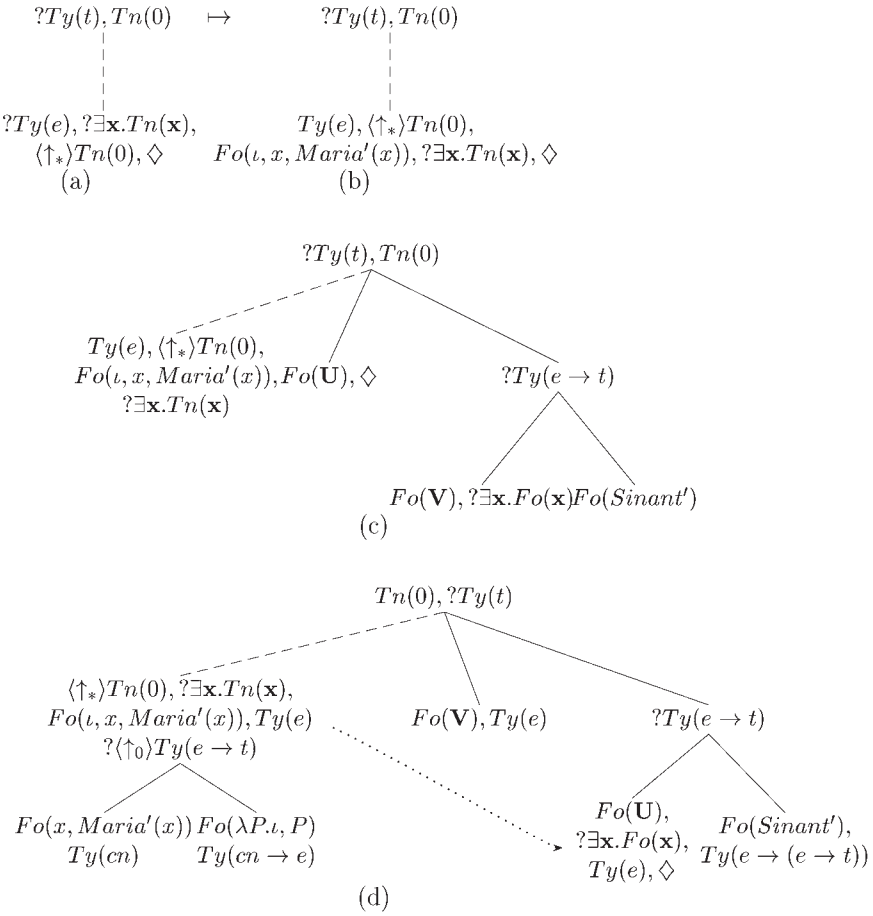

Figure 5.2 Parsing *Ti Maria ti sinantisa xtes*.

nominative may be specified as a requirement of the form ?⟨↑0 ⟩*Ty*(*t*).[9] This sort of requirement is only satisfied as the logical tree is compiled upwards once its terminal nodes are all decorated. Thus, at the point at which the functor *Fo*(*Sinant*) is combined with its argument *Fo*(ι,*x*,*Maria*(*x*)) by functional application to give *Fo*(*Sinant* (ι,*x*,*Maria* (*x*))) the type requirement of that node is resolved as *Ty*(*e*→*t*), now satisfying the structural requirement imposed by the accusative case. Case may, however, play a more constructive role (Nordlinger 1998). For example, in verb-final languages, with their free local NP-ordering within a clause, case specifications may induce the construction of the requisite tree relation[10]:

(12) Jina-ka sakwa-rul mek-ess-ta [Korean]
Jina-NOM apple-ACC eat-PAST-DECL
'Jina ate an apple.'

(13) Sakwa-rul Jina-ka mek-ess-ta
apple-ACC Jina-NOM eat-PAST-DECL
'Jina ate an apple.'

Where such a multiplicity of NPs can occur before the verb, as canonically in Korean, there is no template of structure provided by the verb available at the point at which any one NP is parsed. Hence, all would seem to be unfixed up until the final point at which the verb is parsed. Such an approach is not, however, problem free, as the tree logic underpinning the DS system imposes the restriction that only one type of unfixed tree relation be introduced from a given node at a time.[11] This restriction forces us to presume that case has a constructive function wherever more than one such node appears to be introduced: The case identifies the position in the tree directly and so fixes the node by a process of enrichment, before any subsequent unfixed node is introduced.

The process involved in analysing a sentence like (9), repeated below as (14), is thus one of building an unfixed node, decorating it, and fixing its relation to the local type-*t*-requiring node from the information carried by the case suffix. This sequence of actions is then repeated as many times as necessary. We display the process for this sentence schematically in Figures 5.3 and 5.4.

(14) Sakwa-rul Jina-ka mek-ess-ta
apple-ACC Jina-NOM eat-PAST-DECL
'Jina ate an apple.'

In Figure 5.3, we begin with an unfixed node, which permits the parse of the accusative NP. This node is then updated by abduction on the accusative requirement $?\langle\uparrow 0\rangle Ty(e{\rightarrow}t)$ to provide a fixed position that will satisfy it, to become immediately dominated by a predicate-requiring node, as shown.[12]

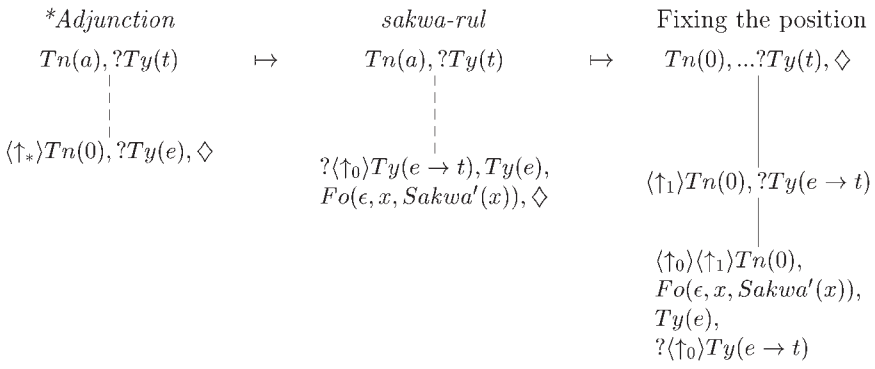

Figure 5.3 Parsing *sakwa-rul* in (9).

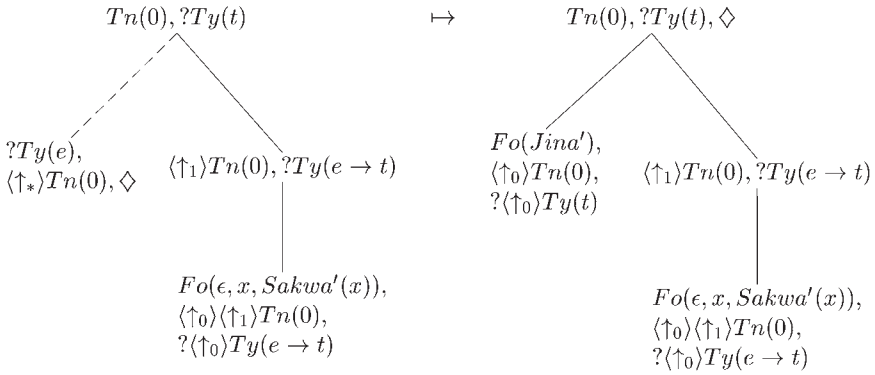

Figure 5.4 Parsing Sakwa-rul Jina-ka in (9).

Figure 5.4 shows the process of going on to parse the subject in (14), *Jina-ka*, again by the strategy of constructing an unfixed node and updating it, this time to become a subject. Finally, in a parse of the words in (14), the actions given by the lexical specification of the verb induce a full template of structure, which unifies with the prior established nodes decorated by the noun phrases. The formula decorations on the nodes then duly combine to yield a tree whose top-node is the propositional formula below, which decorates a binary-branching tree exactly as required: *Fo(Mek′(ε,x,Sakwa′(x))(Jina′)), Ty(t)*. It is thus the successive application of **Adjunction* plus immediate updating of such unfixed nodes that underpins the free ordering of NPs within a clause.[13] Notice how the resulting structure is identical to the structure derived from the English parsing actions, commensurate with the view that structures underpinning natural language are universal, with differences between languages residing in relative weight of computational and lexical actions in yielding such logical-form structures as output.

It is no coincidence that this characterization of how unfixed nodes can be introduced and then updated has been in terms analogous to the process of interpreting a pronoun as a metavariable and then updating it with some fixed value; both are expressed in the same terms, that of update from one partial tree to another. Extending this parallelism, we define a set of processes introducing unfixed nodes, each subject to a distinct locality constraint on the domain within which the underspecified tree relation needs to be resolved. So three discrete adjunction processes are defined:

(i) *Local*Adjunction*, a process of introducing an unfixed node that has to be locally resolved within a single predicate-argument array;
(ii) **Adjunction*, a process of constructing an unfixed node that has to be resolved within an individual tree but not necessarily locally;
(iii) *Generalized Adjunction*, a process constructing a node without any constraint on the fixing of its relation to other nodes in the tree other than having to be determined within the overall construction process.

Of these, it is the first two that play an essential role in this chapter, with *Local*Adjunction* operative in short scrambling, as we have just seen. **Adjunction* is the process already introduced in connection with English, which we return to in discussing long-distance scrambling.[14] The use of this range of strategies for licensing the introduction of unfixed nodes, with its natural parallelism with constraints on anaphora, provides a notable advantage in addressing verb-final languages, since the assumption that at some level all languages project the same structural configuration can be preserved without having to postulate the extensive movement operations needed to sustain such a universalist claim in other frameworks (Kayne 1994; Simpson and Bhattacharya 2003). There are properties distinctive of all such DS analyses. First, lexical items do not decorate trees themselves, nor is structure defined over strings. The items that decorate the nodes of the tree are sub-terms of the logical-form language, and words are procedural devices that provide the actions that lead to such tree decorations. Second, decorations on the resulting tree show no reflex of the linear order of the words, nor of the syntactic process that led to such a tree. The hierarchical configuration given by an individual tree reflects solely the mode of combination that leads to a resulting interpretation. As a mapping from a string onto a semantically transparent tree structure, this might seem a notational variant of much more standard accounts of left-periphery effects in terms of the twofold distinction between base generation (involving essential anaphoric co-indexing) and generation by movement. But, as we shall see, the possibility of structures with characteristics partly redolent of movement, partly of base generation, will emerge here unproblematically as mixed effects that arise through the feeding relations between anaphora and tree growth process, as an interpretation is progressively built up. This is made possible precisely because the tree does not record putative distributional properties of expressions and there are no left-peripheral positions in the tree to be inhabited by left-dislocated expressions.

3. ANALYSING THE LEFT PERIPHERY

3.1. Building Linked Structures at the Outset

In DS, not all apparent embedding is reflected in the structure of a single tree. In particular, relative clauses are analysed as involving the construction of pairs of independent propositional trees that are linked anaphorically through the sharing of some term. The process of inducing such pairs of semantic trees is permitted by an additional modal operator relating them, $\langle L \rangle$, and its inverse $\langle L^{-1} \rangle$. In analysing relative clauses, a rule is defined to yield a transition from an arbitrary node in one tree across a LINK relation to the top node of a new propositional tree. This tree further has a requirement that as it is constructed one of its nodes must share a term with the node (the 'head') from which the transition was constructed. This copy

is, in English, supplied anaphorically by the relative pronoun. Notice, for example, the interpretation of *who* as picking out the same individual as that assigned to *John*:

(15) John, who Sue upset, cried.

We will not go into details of the analysis of relative clauses here (but see Kempson et al. 2001). However, the action of introducing paired trees of the sort associated with relative clauses applies more generally than just to a single construction type: It is a general computational action that projects, from a node decorated by some term, α, a linked tree that is required to contain a copy of α. This permits a characterization of topic structures as involving precisely this: an initially constructed tree of type *e*, decorated by some term, LINKed to a propositional tree required to contain somewhere within it a copy of that term. This schematic structure is shown in Figure 5.5.

Note here the tree decoration, $?\langle D\rangle Fo(\alpha)$, which is a requirement that somewhere in the tree as it develops there must be a node decorated with $Fo(\alpha)$, whatever might be. The modality $\langle D\rangle$ is an operator defined not just over an indefinite number of dominance relations, $\langle\downarrow\rangle$, but also over an indefinite number of LINK relations, $\langle L\rangle$. This is extremely weak as a structural constraint and allows dependency into strong islands. In relative clauses, this requirement is met by the relative pronoun, but in topic structures, where no such encoded pronoun exists, it is the full range of anaphoric devices that can be made use of.

The bonus of having independent justification for an account of relative clause construal in terms that involve essential anaphoric connectedness is that it immediately carries over to the entire class of so-called 'orphan' structures, including topic structures:

(16) As for John, Sue upset him.

(17) Der Hans, heute will anscheinend [German]
the-NOM Hans today wants apparently
keiner ihn unterstützen
no-one-NOM him-ACC support
'Hans, today no-one apparently wants to support him.'

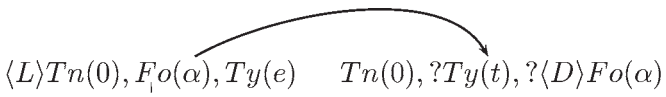

Figure 5.5 Building a LINK transition for topic structures.

Though a familiar puzzle since identified by Haegeman (1991) (reprinted in this volume), orphan structures have remained hard to explain in frameworks where the remit is delimited by assigning to each sentence of the language a unique structural analysis for any one interpretation: These fail to fit into the structural hierarchy of the remainder of the string of which they form a part. As Shaer and Frey (2004) put it (see also Shaer, this volume), echoing Haegeman, these 'are independent of the host sentence and integrated into it by non-syntactic means.' However, in a framework in which strings are paired, not with structures representing words and distributional units formed from them, but with structures representing the interpretation constructed from those words, there is no a priori reason for imposing a one-to-one correspondence between sentential string and an individual structure—coordination indeed provides a whole range of examples where a single string is mapped onto more than one structure (see Cann et al. 2005; henceforth *DoL*). To the contrary, in DS one of the core transitions in the building up of interpretation for a sentential string is the pairing of structures linked solely through a required sharing of terms; this defined relation is part of the overall network of tree-growth processes, used to model island constraints, relative clause construal, coordination, and other constructions.

As noted, the obligatory co-dependency of pronoun and left-peripheral expression is secured by the formulation of the constraint for there to be a shared term in the two structures imposed by the requirement on the introduced type-t-requiring node of some tree subsequently to be constructed. This requirement does all the work. So the obligatory sharing of a term in the two structures is not some 'non-syntactic' mechanism; it is an essential consequence of the system of constraints. This strategy corresponds to hanging topic left dislocation (HTLD; Anagnostopoulou 1997), and is displayed by Greek mismatching case effects as in (2) and the German example below:

(18) ?Der Hans, seine Mutter hat ihm ein Auto
the-NOM Hans his-NOM mother has him-DAT a-ACC car
geschenkt.
given
'(As for) Hans, his mother gave him a car.'

As we would expect of a derivation in which a pair of linked structures is developed, there should be no case specification providing instructions on decorating the linked structure, as that node will not be updated during the course of the derivation to become itself a fixed node in the primary structure: The two trees remain as independent structures in the output. So, in these structures, we get the first indication that nominative case is distinct from other cases in not being associated with an output filter for some fixed position in the tree.[15]

The form of the requirement imposed in the LINK transition in Figure 5.5 is given in its weakest form. However, given that this is expressed in terms of a modal requirement, we have an immediate basis for variation and can define natural variants by varying the modal operator. For example, we can vary the domain within which the copy is to be provided to that involving the $\langle\downarrow^*\rangle$ relation, which means that the copy is required to occur only within an individual tree and not in some linked tree, thus not allowing strong island violations. With this variation, we have a paired structure with essential anaphoric connectivity but whose requirement matches the constraint imposed by introducing an unfixed node whose position has to be resolved within an individual tree. This constraint appears to be operative in Korean, and also in Romanian[16]:

(19) ??Sakwa-nun Jina-ka mek-un haksayng-ul [Korean]
apple-TOP Jina-NOM eat-REL student-ACC
a-n-ta.
know-PERS-DECL
'As for an apple, Jina knows the student who ate.'

(20) *Pe Ion n-am întînit fata care [Romanian]
As-for John not-I-have met the girl which
l-a văzut anul trecut.
him-has seen the-year last.
'As for John, I have not met the girl who saw him last year.'

So we get the first blurring of the anaphoric and structural forms of update, a tightening of the locality constraint that yields clitic left dislocation effects in head-initial languages (CLLD; Cinque 1990), with its intermediate status, in having some characteristics diagnostic of movement. Despite the varying stringency in the way such requirements have to be met, all share one property: The presented term that constitutes the point of departure for the LINK transition acts as a context relative to which the subsequent emergence of structure is defined. All such developments display a term that is shared with the structure that forms the starting sequence of the actions building a linked structure. Such an analysis, accordingly, reflects the way in which, in both HTLD and CLLD structures, the first expression is construed as providing a context.

3.2. Building Unfixed Nodes at the Outset

Having at hand both the strategies of **Adjunction* (in its various forms) and LINK Adjunction, we have, of course, more than one means of constructing interpretations from left-peripheral expressions. Applications of **Adjunction*, unlike the construction of linked structures, signally do not reflect any required pairing between an anaphoric expression and the node taken to be introduced

by the rule itself, as the update of the introduced unfixed node does not turn on the presence of an anaphoric expression. However, such a strategy may yet be possible in the presence of a pronoun within the primary structure, as we have already seen in Greek clitic-doubling sequences (Figure 5.2).[17]

There is an immediate consequence of proposing any such analysis, so far ignored, which is important in setting out bases for cross-linguistic variation. As Figure 5.2 shows, any pronominal expression that serves to identify the node with which the unfixed node is to unify must decorate a non-terminal node in the tree: This puts it in a category unlike other lexical expressions—one basic criterion of wordhood has got lost. This is a source of variation not only between individual languages, but also between individual pronouns within a single language. It notably matches the distinctiveness of dative clitic doubling in Spanish, which, unlike all other clitic-doubling constructions, is not subject to any specificity restriction: all NPs, quantified or not, can occur with dative clitic doubling (see *DoL*):

(21) A familias de pocos medios (les) ofrecieron queso y
to families of small means (to them) they offered cheese and
leche
milk
'To low-income families, they offered cheese and milk.'

There is a further phenomenon that this analysis would lead us to expect. Since we are taking this terminal-node restriction to be definitive of a word's contribution to compositionality defined on the semantic tree, we would not expect the argument nodes that a verb may induce themselves to be subject to any such terminal-node restriction. And accordingly, we expect that there will be two different forms of interpretation for subject position in all pro-drop languages, hence in Spanish and Korean alike. This is because the argument node that the verb decorates may have its value determined in one of two ways. Either the value of the metavariable at the argument node may be provided by building a LINKed structure, taking the term projected from the subject expression to decorate the introduced LINKed-structure node, and then using it to provide the context for identifying the value of this metavariable by a process of substitution. Or the value of the metavariable may be provided by taking the subject expression to provide decorations on an unfixed node, unifying this unfixed node with the subject node provided by the verb. And indeed, as is widely observed of such languages, both subject pro-drop and full pro-drop, the subject expression can function either to serve a focus effect, or more neutrally.[18] Figure 5.6 schematically illustrates these two modes of analysis for the Korean sentence in (22), repeated from (8).[19]

(22) Jina-ka sakwa-rul mek-ess-ta
Jina-NOM apple-ACC eat-PAST-DECL
'Jina ate an apple.'

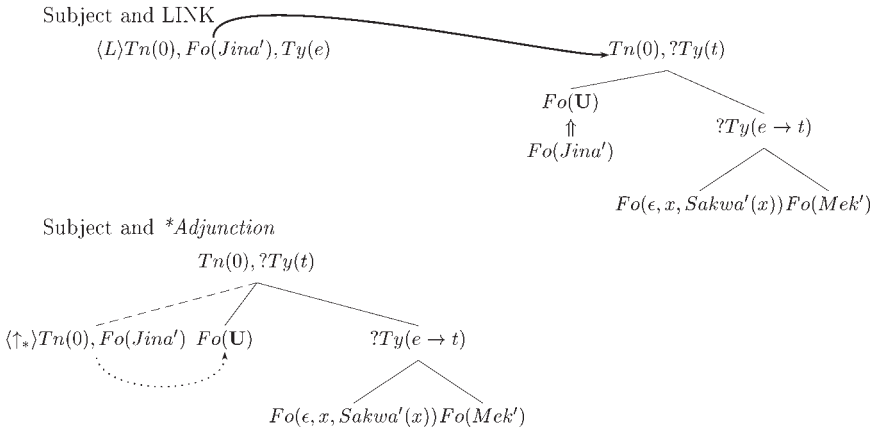

Figure 5.6 Two ways of analysing subjects in Korean.

Notice, more generally, what these two strategies provide. We have one anaphorically based strategy for building paired trees, over which a range of locality restrictions can be defined, with expectation of cross-linguistic variation. And we have a strategy using the building of an unfixed node within a single tree, into which pronouns of a certain category can provide input, again with expectation of cross-linguistic variation. There is no problem in positing two such alternative strategies, as the parsing perspective allows a number of alternative ways of constructing a given semantic representation. We immediately expect the two commonly observed variant forms of a left-peripheral expression that we have already illustrated with Greek: one assigned a case that matches that of the immediately following pronominal, one in which that left-peripheral expression takes nominative case. Like other case-rich languages, German displays this pattern, (23)–(24), suggesting that in German too the demonstrative pronoun has lost its terminal node restriction, unlike the full pronoun.

(23) Den Hans, (den) mag jeder [German]
the-ACC Hans (that-ACC) likes everyone-NOM
'Hans, everyone likes.'

(24) Der Hans, den mag jeder
The-NOM Hans that-ACC likes everyone-NOM
'Hans, everyone likes.'

And, equally as one would expect, it is the form with case-mismatching that displays no sensitivity to island constraints, whether or not the anaphoric dependence is established through a demonstrative or other anaphoric expression, because the case-mismatching indicates the construction

of a LINK transition, rather than the introduction of an unfixed node to be merged into the single structure. These alternative strategies of, on the one hand, introducing a LINK transition across otherwise independent structures and, on the other, an unfixed node within a single structure, provide the means of reflecting a number of intervening phenomena, a bonus made available by the underlying concept of what it means to construct partial structures that get updated.[20] This is distinct from movement accounts, for which such mixed effects, apparently blurring the dichotomy between movement and base generation, are problematic.[21] So the distinction between German weak pronoun left dislocation (WPLD) and German hanging topic left dislocation (HTLD) set out in detail by Shaer and Frey (2004) (see also Shaer this volume) can be modelled in DS terms as a distinction between demonstrative forms and the other fuller set of anaphoric devices in that the former lack any terminal node restriction. It is thus only demonstratives that can interact with what in other frameworks is a process of movement (in DS the process of updating an unfixed node); other pronouns are anaphoric expressions that maintain a connection with other lexical expressions in precluding update through unification with some unfixed node, merely providing input to a process of substitution of some antecedent term. Hence, we have the difference in island sensitivity between the two processes, holding only WPLD despite the optional presence of the pronoun. Because the unfixed node decorated by the left-peripheral expression is incorporated into some fixed position in the unfolding tree in WPLD, we expect the necessary case matching that is absent from HTLD, where the tree decorated by the dislocated expression is independent of the main propositional structure. Furthermore, the reconstruction facts available in the presence of the demonstrative (and other expletives, see Section 4.2), but not in the presence of other anaphoric devices, follow directly[22]:

(25) Seinen vierzigsten Geburtstag, den möchte kein Professor
his fortieth birthday it would like no Professor
alleine verbringen.
alone spend
'His fortieth birthday, no professor wants to spend it alone.'

Notice that we expect interaction between anaphora and long-distance dependency, which the DS account explains as the natural outcome of the different processes of structural and anaphoric update exemplified in our analyses of WPLD and HTLD. So we expect (26):

(26) Der Alex, den Wagen, den hat seine
the-NOM Alex the-ACC car that-ACC has his-NOM
Mutter ihm gestern geschenkt
mother him-DAT yesterday given
'Alex, the car, his mother gave him yesterday.'

The initial noun phrase, *der Alex*, decorates a tree linked to the main propositional tree on which it imposes a requirement to find a copy of the term it projects, hence no case-matching is required. The second noun phrase is parsed as decorating an unfixed node whose position in the tree is determined by its accusative case-marking, which is recapitulated and fixed by the demonstrative pronoun, as shown schematically in Figure 5.7. Alternative orders are impossible, as are alternative anaphoric dependencies, all as predicted by our account:

(27) *Den Wagen, der Alex, den hat seine
the-ACC car the-NOM Alex that-ACC has his-NOM
Mutter ihm gestern geschenkt
mother him-DAT yesterday given

(28) *Der Alex, den Wagen, dem hat seine
the-NOM Alex the-ACC car that-DAT has his-NOM
Mutter ihn gestern geschenkt
mother it-ACC yesterday given

Of course, there is much more to be said to present a full characterization of the rich set of data provided by Shaer and Frey, but in principle, within a framework in which the data do not have to be analysed as involving a non-syntactic relationship, they do not seem intransigent. And we have the advantage that the system itself articulates a system of tree growth that brings the 'orphan' phenomena back into the fold of data that the syntactic system can characterize, while nevertheless reflecting directly their apparently 'non-integrated' behaviour.

3.3. Multiple Scrambling at the Left Periphery

Before turning to the right periphery, we note a novel advantage that emerges from having distinguished the two processes **Adjunction* and

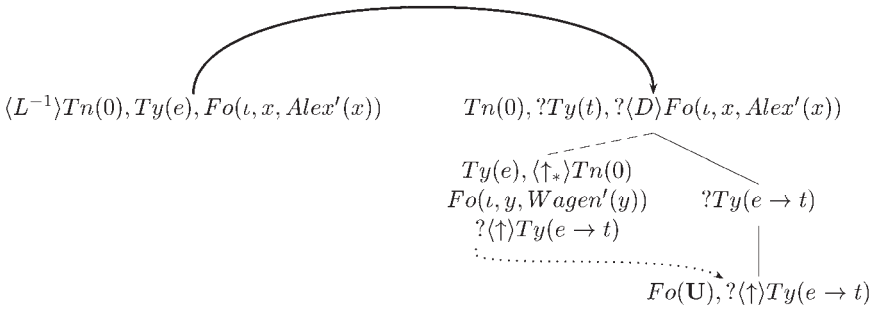

Figure 5.7 Parsing *der Alex, den Wagen, den*.

*Local*Adjunction*, with both processes introducing an unfixed node from a node requiring type. We can expect the one rule to feed the other, if we just define **Adjunction* as creating an unfixed node which itself bears the requirement ?*Ty(t)*.[23] This assumption immediately yields the multiple long-distance scrambling effects observed in verb-final languages. For example, in Korean, there are examples such as (29) (repeated from (10)), which can have either an 'object long-scrambled' reading or an 'object-subject pair long-scrambled' reading.

(29) Sakwa-rul Mina-ka Jina-ka mekessta-ko malhayssta
apple-ACC Mina-NOM Jina-NOM ate-COMP said
lit. 'The apple, Mina said that Jina ate.'
'Jina said that Mina ate an apple.'

Phonological information buttresses the assumption of a constituency break that has to be constructed on this analysis, making the requisite strategy definitively salient. For example, when there is an intonational break between '*sakwa-rul*' and '*Mina-ka*,' two lexical elements cannot be interpreted as one constituent or one pair. Yet, when there is a break between the first subject '*Mina-ka*' and the second subject '*Jina-ka*,' the object '*sakwa-rul*' and '*Mina-ka*' forms a constituent and yields a pair-wise reading. These so-called 'surprising constituents,' and their apparent demonstration of multiple long-distance scrambling, require special stipulation in other frameworks.[24] A property diagnostic of such 'surprising constituents' (which can be built up from two or more NPs in sequence) is the necessity of interpreting them locally with respect to each other. Compared to (29), (30) is not well-formed, because the only possible interpretation would be one in which the dative is construed as modifying the intermediate predicate projected by *malhayssta* 'say,' and this is not available, as the initial dative and accusative noun phrases must be construed within the same propositional structure:

(30) *Yuna-ekey sakwa-rul Mina-ka Jina-ka mekessta-ko
Yuna-DAT apple-ACC Mina-NOM Jina-NOM ate-COMP
malhayssta-ko saynggakhayss-ta
said-COMP thought-DECL
(intended) 'Jina thought that she said to Yuna that Mina ate an apple.'

On the DS account, these data are simply as expected. With **Adjunction* defined to license the introduction of a type-*t*-requiring node, we predict that it will feed into one or more applications of *Local*Adjunction*. This is because we can construct successive projections of locally unfixed nodes from this intervening *Ty(t)*-requiring node, each updated to a fixed local relation. The result is an incomplete structure decorating an unfixed node, itself to be updated later in the parse, which may be indefinitely far away in

the emergent tree. But this derivation, with *Local*Adjunction* able to apply successively,[25] leads to the prediction that apparent instances of multiple long-distance dependency must be interpreted locally to one another. The two forms of construal for (29) are displayed in Figures 5.8 and 5.9.

Figure 5.8 sets out the regular long-distance dependency using the construction and decoration of an unfixed node of type *e* unifying subsequently with the subordinate object node.[26] Figure 5.9 displays the use of a step of **Adjunction* followed by two steps of *Local*Adjunction*, each node so introduced getting immediately fixed by the actions induced by the case specification of the noun phrase. It is then the incomplete *Ty(t)*-requiring node unifies with the subordinate node developed by the actions of *mek*-'eat,' in so doing, providing the object and indirect object values of the verb.

In a framework in which concepts of structural underspecification are central, such multiple long-distance scrambling effects, with their particular incomplete-structure formation, are no more surprising than the phenomenon of long-distance dependency itself.[27]

The flexibility within limits of dative-marked NPs is also expected. In particular we expect that, in circumstances where a pair-wise interpretation of two left-peripheral NPs is debarred, as in (31), where the embedded predicate is *mekessta* 'eat,' the only possible interpretation of the dative *Jina-ekey* 'to Jina' is as part of the matrix predicate-argument structure:

(31) *Sakwa-rul Jina-ekey Mina-ka Yuna-ka mekessta-ko
apple-ACC Jina-DAT Mina-NOM Yuna-NOM ate-COMP
kiekhayssta-ko malhayssta
remembered-COMP said
(intended) 'Mina said to Jina she remembered Yuna ate the apple.'

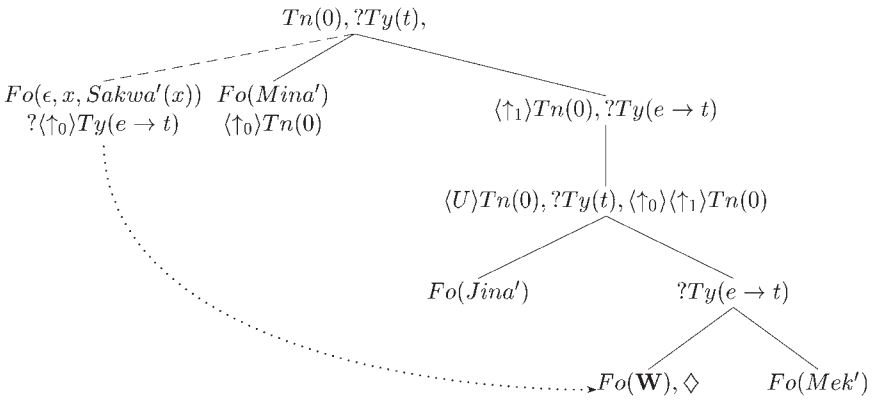

Figure 5.8 Left dislocation of *sakwa-rul*.

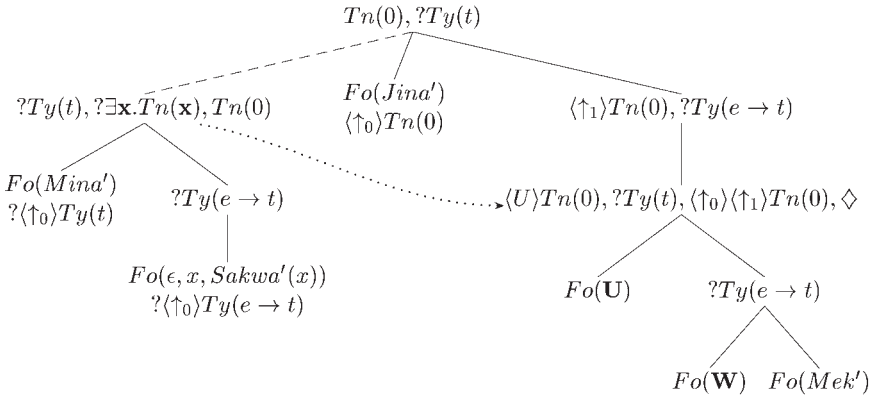

Figure 5.9 Left dislocation of *sakwa-rul Mina-ka*.

4. AT THE RIGHT PERIPHERY

In turning to the right periphery, the various constructs we have set up in analysing left-periphery effects come into their own, with minor variations that we can anticipate in virtue of the asymmetry between constructional processes operating at the closing stages of the interpretation process rather than as an opening sequence of actions. In particular, we shall use the building of linked structures, the building of unfixed nodes, and variation between pronouns as to whether or not they decorate a terminal node in the tree under construction.

4.1. Building Linked Structures in the Closing Stages

First, just as at the left periphery, we expect that a right-provided expression, placed outside some clausal sequence, might be interpreted by building a LINK transition, with a background-topic form of interpretation, and so it can. In many (and we would predict, all) languages, it is possible to interpret an expression with a pronoun in canonical position, buttressing its interpretation by some end-placed expression, and with topic-marking languages, we duly expect end-placed topic-marked NPs to occur:

(32) lo conosco, Giovanni. [Italian]
him I-know Giovanni
'I know him, Giovanni.'

(33) I think you should realize that it's an impossible topic, right dislocation.

(34) Tutie wa-ss-ta Chris-nun [Korean]
Eventually come-PAST-DECL Chris-TOP
'Eventually he came, Chris.'

We refer to this form of backgrounding as *recapitulation* (see *DoL*, ch. 5), and analyse it as shown in the schematic transition shown in Figure 5.10.[28]

Though this rule has to be explicitly defined, it is the mirror image of the early topic adjunction rule, and just what we would expect, given that there is no ordering on the tree as to which of two linked trees is built first. We can now see what sort of interpretation a string whose structure is built up by this strategy has. Given that the pronoun in canonical position is construed as decorating a fixed node (in the clitic case, initially unfixed but immediately enriched to become fixed), it will, unless expletive, have to be interpreted as indexical, identified from some term provided by the larger context. But this means that in order to justify a LINK transition, the move to the LINKed structure will impose a requirement to identify the term decorating that linked structure in such a way as to yield a term identical to that which is interpreted from the pronoun. It is therefore interpreted as buttressing the already indexically fixed construal of the pronoun, hence its background-topic effect.[29]

4.2. Building Unfixed Nodes in the Closing Stages

Second, we expect there to be instances of **Adjunction*, though, as we now see, this goes hand in hand with the characterization of some pronouns as not decorating a terminal node in the resulting structure. The concept of defining some pronouns as losing their terminal node restriction provides an immediate explanation of expletive pronouns, the other major property of the computational system of natural language[30]:

(35) It's possible that I am wrong.

As we have already noted in our description of left-periphery effects, some pronouns, while remaining expressions with full anaphoric potential, may lose one essential property of being a regular lexical expression in that they lose a terminal-node restriction, and this is an attendant and expected property of all argument nodes projected by a verb with pro-drop properties. This property is all we need to characterize expletive pronouns. With such an account, a derivation will be licensed in which the expletive

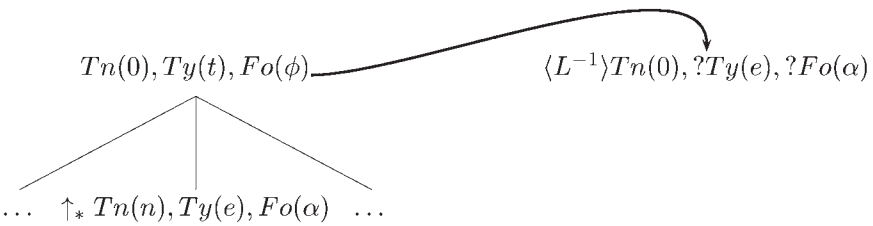

Figure 5.10 Licensing linked structures at the right periphery.

projects a type value and an incomplete formula value, a meta-variable like any other anaphoric expression, but one that, in failing to be assigned a contextually provided value, may have that value established later by the subsequent development of structure. Indeed, such a process is essential if a formula value is to be provided, for without it the top-node's requirement will not be able to be met, and there would be no successful completion of the interpretation process.

In English, this sub-use of the pronoun *it* requires specific itemization, as the pronoun of type *e* is not associated with any such expletive effect (Figure 5.11). The action that introduces the node allowing late development of the tree is an atrophied variant of **Adjunction*, which we refer to as *Late*Adjunction*, which is all we would expect once the entire structure has been constructed. The reason for this is twofold. First, the process is one of building an unfixed node of the same type as its dominating node. Such a process is a sub-part of the steps involved in introducing an unfixed node at the left periphery and progressively evaluating whether it can be unified with a fixed node through a tree. This proceeds step by step, node by node, as the tree is progressively constructed, so that at the point of unification, the properties of the unfixed and fixed node are considered together. It is this configuration that is directly constructed in *Late*Adjunction*. Second, in the case of expletives, with the pointer back at the subject node, the tree under development will be complete, apart from this late step of development. This is because in order for the pointer to be moved back to the subject node, the predicate must have been fully developed and compiled with type requirement and formula value fully specified, for this is a necessary prerequisite for movement back up the tree from daughter to mother. It is thus only in seeking to compile a formula value at the top-node that the outstanding requirement at the argument daughter emerges as a block on any such top-node decoration. Accordingly, the pointer will return from the mother node to that node, licensing the introduction of a node of the very same type,

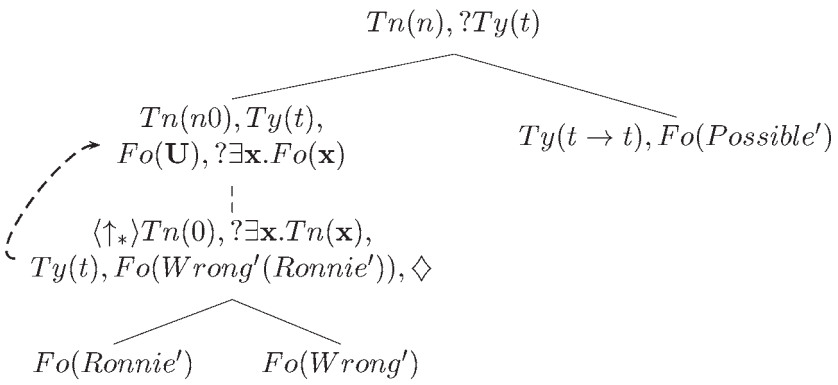

Figure 5.11 Parsing *It is possible that I am wrong.*

which, once developed, can unify with that subject node to satisfy whatever outstanding requirements it has. Hence the only possible application of **Adjunction* at this late stage is the introduction of an unfixed node of the same type, exactly preparatory for a step unifying the two nodes.

The bonus of this style of explanation is that it yields the right roof constraint as an immediate consequence. Progressive decoration of nonterminal nodes up the tree is only possible if all requirements on pairs of daughter nodes for each mother are satisfied; the successful decoration of the mother node depends on this. So though the pointer may move away from some daughter node through the use of such devices as expletive pronouns, the compilation of properties at its mother node will need all requirements satisfied. This yields the right roof constraint immediately. We expect that extraposition effects will be essentially local, and moreover end-placed in some clausal sequence.[31] And so it is that from an embedded sentential subject, as in (36), it is impossible to have a place-holder in that subject position, and its associated clause removed to the right periphery of the matrix predicate, as in (37) (*DoL*, ch. 5):

(36) That it is certain that I am wrong is unfortunate.

(37) *That it is certain is unfortunate that I am wrong.

In order for (37) to be well formed, it would have to be possible to leave the construction of that embedded subject structure altogether, move the pointer from that structure to develop the matrix predicate, and then move back into the embedded subject at some late stage to complete its requirements. Given this restriction on pointer movement, such early movement of the pointer out of the embedded structure is impossible, a restriction that applies right across the Germanic languages.[32]

This account of expletive pronouns imposes no restriction that it is only lexically realized pronouns that might lack such a terminal node restriction. To the contrary, we expect that in pro-drop languages, no such expletive will be necessary, given the lack of bottom restriction on argument nodes decorated by the verb. The particular provision of a type specification and metavariable allows the node either to be interpreted by substitution of some contextually provided value, or by late provision of a term, as we would expect:

(38) Compró un coche Maria [Spanish]
bought a car Maria
'She bought a car, Maria.'

(39) Tutie wa-ss-ta Chris-ka [Korean]
Eventually come-PAST-DECL Chris-NOM
'Eventually he came, Chris.'

In Korean, we also find the same locality constraint operative. Unlike left-periphery effects, such late adjunction is restricted to matrix arguments—the right roof constraint again in evidence:

(40) Mina-ka Jina-ka sakwa-rul cwuessta-ko malhayssta
Mina-NOM Jina-NOM apple-ACC gave-COMP said
Yuna-ekey
Yuna-DAT
lit. 'Mina said to Yuna that Jina gave an apple.'
*'Mina said that Jina gave an apple to Yuna.'

(41) *Mina-ka Jina-ka sakwa-rul cwuessta-ko kiekhayssta
Mina-NOM Jina-NOM apple-ACC gave-COMP remembered
Yuna-ekey
Yuna-DAT
*'Mina remembered to Yuna that Jina gave an apple.'

The reason is, as before, that to compile an interpretation for the matrix predicate, all more subordinate structure must be fully decorated. Argument nodes of that matrix predicate may be returned to for further development, exactly analogous to subject pro-drop effects in the Romance languages, and as though an expletive pronoun were present; but subordinate argument nodes are not accessible.

There is one further prediction, contrary to left-periphery effects, given the dynamics of the update process. Though only one unfixed node of a type is licensed at a time, this injunction holds only as long as that node is unfixed. Once a node introduced by **Adjunction* has had its position in the tree resolved, application of *Late*Adjunction* will be possible. We therefore correctly expect the co-occurrence of an expression at the left periphery and an expression at the right periphery, despite the restriction as shown in (42)–(43), where use of such peripherally placed expressions is contrastive, a matter to which we return in discussing (44) and (45).

(42) Sakwa-rul Mina-ka Jina-ka cwuessta-ko
apple-ACC Mina-NOM Jina-NOM gave-COMP
malhayss-ta Yuna-ekey
said-COMP-DECL Yuna-DAT
'An apple, Mina said to Yuna that Jina gave.'

(43) Un coche compró María [Spanish]
A car bought Maria
'A car, Maria bought.'

With the two processes of either extending the tree or building a paired linked tree available at the right periphery, we expect, as at the left periphery,

a range of mixed effects. In Korean, the combination of these strategies, with the potential provided by choices between no pronoun, case-marked pronoun, and topic-marked pronouns, licenses a rich array of effects. There can be non-suffixed use of names, which arguably matches their introduction into the tree following a step of *Late*Adjunction*:

(44) Tutie wa-ss-ta Chris
Eventually come-PAST-DECL Chris
'Eventually he came, Chris.'

There are also both case-marked and topic-marked end-placed names, to be characterized by *Late*Adjunction* and a *LINK* transition, respectively:

(45) Tutie wa-ss-ta Chris-ka/-nun
Eventually come-PAST-DECL Chris-NOM/-TOP
'Eventually he came, Chris.'

5. SUMMARY

In this chapter, we have set out two basic concepts of tree growth, using these to sketch an analysis of left- and right-periphery effects that has extended naturally to verb-final languages. Notable new results are the accounts of multiple scrambling at the left periphery and the right roof constraint at the right periphery, both of which are problematic for other frameworks (minimalism, LFG, and HPSG alike). This asymmetry between left- and right-periphery effects is a notable bonus over other frameworks, for which symmetry is in principle expected, all asymmetries requiring special stipulation. We thus conclude that properties of natural language syntax are founded directly in the dynamics of the parsing process.

By way of a coda, we note that we have made no specific reference within the analysis itself of concepts of topic and focus. This omission is deliberate. We take the terms *topic* and *focus* to be labels for a range of update effects that depend on the setting out of structure taken to be background, and its progressive update. Within the DS framework, there is no reason in principle why the building of a LINK transition should be assigned a fixed interpretational effect in terms of which, say, the concept of topic should be defined. Nor is there any fixed process of construal associated with the construction of an unfixed node. Rather, as we have seen with both anaphoric expressions and structural processes alike, the update operations defined provide a mechanism for update whose interpretive effect depends on the point in the interpretation process at which it takes place. The difference between left-peripheral and right-peripheral construction of LINKed structures (the DS analogue of hanging topic left dislocation and right dislocation) is a case in point. Another is the asymmetry between the application of **Adjunction*

early on in a parse process where there is virtually no associated structure with the emergent tree in which the process applies, and its application at a late stage of a parse process, when it can only be used to provide some update to some node already introduced (long-distance dependency versus expletive construal). Hence, even though the transition that induces a LINK relation between a pair of structures does indeed define a structural context against which some subsequent structure is to be built, and even though the construction of an unfixed node is indeed a mechanism for introducing a node that must be subject to subsequent update, there is no reason to impose a one-to-one correspondence between the mechanisms themselves and their interpretive effect (Newmeyer this volume). Importantly, it is not that we expect no correlation. To the contrary, what we expect is that the availability of the mechanisms plus the effect of their application at different stages of the interpretation process will provide all that is needed to analyse all the various concepts of topic and focus—background topic, contrastive topic, contrastive focus, and so on (see Erteshik-Shir 1997). These concepts themselves would signally not be primitives in the explanation, but rather epiphenomena emerging from the interaction of the update mechanisms themselves, together with the context of utterance.

NOTES

1. Glosses of word-by-word translations include the following abbreviations:

   NOM subject marker
   ACC object marker
   DAT indirect object marker
   TOP topic marker
   PAST past tense marker
   PRES present tense marker
   DECL assertion marker
   COMP subordination marker
   REL relative clause marker

   We are grateful to Eleni Gregoromichelaki for help with the Greek data and to Lutz Marten for help with the German data.
2. This is often not considered to be a right-periphery effect, despite involving co-dependency between an anaphoric expression and some complex constituent at the right edge of a clausal sequence.
3. In Kaynian analyses, these are necessarily analysed in terms of leftward movement, but this leaves unexplained the distinct constraints that need to be imposed (Kayne 1994).
4. We are grateful to all those over recent years who have helped in the exploration of syntax through the dynamics of incremental processing. Particular thanks to Wilfried Meyer-Viol, without whom the formal framework could not have emerged in this form. Work for this chapter was supported by the Leverhulme Trust's professorship to the first author.
5. All noun phrases are taken to project terms of type *e*. The logical language in terms of which these *Formula* values are expressed is the epsilon calculus, the language constituting the formal study of arbitrary names of predicate logic

proofs. Accordingly all quantification is expressed in terms of type *e* terms, with all scope dependencies expressed within the restrictor of the individual terms. We leave this on one side in this chapter. See Kempson et al. (2001, ch. 8) and Kempson and Meyer-Viol (2004).

6. Treenode addresses are defined by the predicate *Tn*, which takes values from strings of binary numbers (i.e., the language 0{0, 1}*). These binary numbers indicate the relationship of a node with respect to the top-node, 0 indicating an argument node and 1 a functor node. In Figure 5.1, the node decorated by *Fo*(*Mary*) thus has the address *Tn*(010).
7. Formally, this characterization of domination in terms of the Kleene star operator is standard in tree-theoretic grammars (see Rogers 1995), and is identical to *functional uncertainty* of LFG (Kaplan and Zaenen 1989), but the DS characterization is distinctive in incorporating the dynamics of the progressive updating of that specification within an individual construction process from left to right.
8. We use the iota term ι,*x*,*Maria*(*x*) to reflect definiteness, with the determiner providing the functor node, and the noun providing the pair of nodes decorated by a variable and its restrictor. Arguably, all natural-language names project this type of structure, with Greek reflecting this in its morphology. In general, however, we suppress this level of detail. We also here ignore the effect of gender and person for convenience.
9. At least in some languages. In many languages the articulation of the concept of syntactic subject may be more abstract (see Cann in preparation).
10. The word order variation in local scrambling is reported to involve no difference in propositional meaning. See Büring (1997) and Hoffman (1995). Languages they address are German and Turkish.
11. Thanks to Wilfried Meyer-Viol for extensive discussions persuading us of this.
12. ε,*x*,*Sakwa*(*x*) is an epsilon term, the epsilon calculus equivalent of existential quantification, here ranging over apples (see Kempson et al. 2001).
13. Such local scrambling is associated with fixed scope effects, at least when an indefinite NP precedes a nonindefinite NP. We do not take up scope effects in this chapter, but see Kempson and Meyer-Viol (2004) for a discussion of the extent to which these follow linear order, and explanation of cases which diverge from this.
14. For discussion and definitions, see *DoL* (ch. 6).
15. It might be argued, contrary to this analysis, that quantified expressions may occur left-peripherally, unexpected on an analysis in which these decorate an independent structure, given that quantifier scope is defined internally to one structure (Ben Shaer personal communication):

    (i) A boy they really want one, as they already have a little girl.
    (ii) Any clashes between demonstrators and counter-demonstrators, we'll try to keep those to a minimum.

    However, these examples from Shaer and Frey (2004) are either existentially or generically construed. Though in this chapter we do not address quantificational issues, it is well known that the scope of existential quantification extends beyond the domain of an individual sentence, and we assume analogously the need to define procedures for evaluating occurrences of epsilon terms across more than one propositional structure (see *DoL*, ch. 7). A DS account of plural quantification remains to be given, but if these are taken to involve terms denoting groups, then they too might be argued to be epsilon terms.
16. Romanian has two forms, one analogous to *as for* in English, which is not subject to any such island sensitivity, and one, the simpler form as here, which is.

17. We take the preverbal position of clitics to be a reflex of their being defined as decorating a locally unfixed node which is then updated—just as set out earlier for Korean. This pre-verbal clitic positioning in finite clauses, with their required macro of actions introducing and updating an unfixed node, is arguably a lexical calcification of an earlier system in Latin, in which *Local*Adjunction* generally applied, a sequence of actions that through routinization over time became grammaticalized (see Bouzouita and Kempson forthcoming). Notice that this introduction of an unfixed node for the clitic to decorate is not precluded by the presence of the unfixed node decorated by *Ti Maria*, since **Adjunction* and *Local*Adjunction* are distinct rules associated with distinct, though still underspecified, tree relations.
18. See Belletti (1999) for arguments of the clause-external status of preposed subject in Spanish, Jang (1998) for Korean, and Kitagawa (1986) for Japanese.
19. The double arrow from *Fo(Jina)* to *Fo(**U**)* indicates pragmatic substitution.
20. Given the omission of discussion of quantification in this chapter, we have to leave on one side any detailed account of specificity effects, which are characteristic of clitic-doubled constructions.
21. It is notable that in some recent analyses, the absolute nature of this dichotomy is weakened (Boeckx 2003; Adger and Ramchand 2005).
22. With one such pronoun having shifted into losing its bottom node restriction, the emergence of parallel judgements for other pronouns for at least some speakers as a process of generalization from one subset of pronouns to some larger set is unsurprising, providing a means of explaining what is otherwise a puzzling variability in judgements (see Shaer this volume).
23. No such freedom can be attributed to *Local*Adjunction* as it is defined to ensure essentially local projection of structure with respect to any individual predicate.
24. Koizumi (2000) invokes vacuous verb-raising, Takano (2002) oblique movement. Nordlinger (1998) defines a special constituent-forming operator for analogous effects in Wambaya as triggered by a case-stacking particle, but this will not extend to scrambling data since these lack any morphological trigger. Amongst other frameworks, categorial grammar accounts (Steedman 2000) are best suited to expressing these data given indefinitely flexible type assignment, but like LFG there is commitment to symmetry between distributions at the left and right periphery, and any departures from this are problematic. We are grateful to Mary Dalrymple and Devyani Sharma for discussions.
25. **Adjunction* is defined to apply only to a node that dominates no other nodes, hence cannot apply recursively.
26. One property of this tree that is unexplained here is the relation of the embedded propositional structure to the root, here specified as a fixed relation of immediate subordination. The introduction of the subordinate proposition-requiring node (to be developed by the actions of *mekessta* 'ate') is as a radically unfixed node (possibly even part of a linked structure for a relative clause). The step of interpreting this very weak relation as immediate subordination is one of structural enrichment, analogous to the formula enrichment involved in anaphora construal (see *DoL*).
27. Such surprising constituents are also observed at the left periphery in German, though reported to be of very restricted, literary style:

    (i) Dem Mann das Buch, gab ich, und dem Kind den Teddy.
    the-DAT man the-ACC book gave I and the-DAT child the-ACC teddy
    'To the man the book I gave, and to the child the teddy-bear.'

Pursuing this analysis would require an account of *Mittelfeld* phenomena in German in terms of the same process of *Local*Adjunction*.

28. The use of ↑, without angled brackets, indicates that the formula holds at a fixed node.
29. Note that these data, which can be handled naturally on our account, remain problematic for many other accounts, including that of Cechetto (1999), who recommends that such data simply be set aside on the basis that they are problematic for all. See also Herring (1994), whose informal account of backgrounding effects in Tamil this analysis matches.
30. See Cann et al. (2004) and Cann, Kempson, Marten, and Otsuka (2005) for earlier versions of the ideas set out here.
31. Insofar as this holds for expletives in the predicate, the same principle will apply.
32. See Dipper (2003), who stipulates its restriction to provide a minimally adequate account of the phenomenon in German.

REFERENCES

Adger, D., and Ramchand, G. (2005) 'Revisiting *wh* dependencies: merge and Move,' *Linguistic Inquiry*, 36: 61–93.

Anagnostopoulou, E. (1997) 'Clitic left dislocation and contrastive left dislocation,' in E. Anagnostopoulou, H. van Riemsdijk and F. Zwarts (eds.) *Materials on Left Dislocation*, 151–192, Amsterdam: John Benjamins.

Beerman, D., LeBlanc D., and van Riemsdijk, H. (eds.) (1997) *Rightward Movement*, Amsterdam: John Benjamins.

Belletti, A. (1999) 'Inversion as focalization and related questions,' *Catalan Working Papers in Linguistics*, 7: 9–45.

Blackburn, P., and Meyer-Viol, W. (1994) 'Linguistics, logic, and finite trees,' *Bulletin of the Interest Group of Pure and Applied Logics*, 2: 2–39.

Boeckx, C. (2003) *Islands and Chains*, Amsterdam: John Benjamins.

Bouzouita, M., and Kempson, R. (forthcoming) 'Clitic placement in Old and Modern Spanish: a dynamic account,' in O. Thomsen (ed.) *Current Trends in the Theory of Linguistic Change*, Amsterdam: John Benjamins.

Büring, D. (1997) *Meaning of Topic and Focus: 59th Street Bridge Accent*, London: Routledge.

Cann, R. (in preparation) 'Reconstructing the subject: The dynamics of passive and raising,' University of Edinburgh.

Cann, R., Kempson, R., Marten, L., Otsuka, M. and Swinburne, D. (2004) 'On the left and on the right,' in D. Adger, C. de Cat, and G. Tsoulas (eds.) *Peripheries*, 19–47, Dordrecht: Kluwer.

Cann, R., Kempson, R., and Marten, L. (2005) *The Dynamics of Language*, Oxford: Elsevier.

Cann, R., Kempson, R., Marten, L. and Otsuka, M. (2005) 'Right node raising, coordination and the dynamics of language processing,' *Lingua*, 115: 503–525.

de Cat, C. (2004) 'Dislocation without movement,' in B. Shaer, W. Frey and C. Maienborn (eds) *Proceedings of the Dislocated Elements Workshop, ZAS Berlin, November 2003*, ZASPiL 35: 77–109.

Cecchetto, C. (1999) 'A comparative analysis of left and right dislocation in Romance,' *Studia Linguistica*, 53: 40–67.

Cinque, G. (1990) *Types of A-bar dependencies*, Cambridge, MA: MIT Press.

Dipper, S. (2003) 'Implementing and documenting large-scale grammars: German LFG,' Doctoral thesis, University of Stuttgart.

Erteschik-Shir, N. (1997) *The Dynamics of Focus Structure*, Cambridge: Cambridge University Press.
Haegeman, L. (1991) 'Parenthetical adverbials: The radical orphanage approach,' in S. Chiba et al. (eds.) *Aspects of Modern English Linguistics*, 232–254, Tokyo: Kaitakusha; reprinted in this volume.
Herring, S. (1994) 'Afterthoughts, antitopics, and emphasis: the syntactization of post-verbal position in Tamil,' in M. Butt, T. H. King, and G. Ramchand (eds.) *Theoretical Perspectives on Word Order in South Asian Languages*, 119–152, Stanford, CA: CSLI Press.
Hoffman, B. (1995) 'Computational analysis of the syntax and interpretation of "free" word order in Turkish,' Doctoral thesis, University of Pennsylvania.
Jang, Y. (1998) 'Multiple subject and characterization,' *Discourse and Cognition*, 5.
Kaplan, R. and Zaenen, A. (1989) 'Long distance dependencies, constituent structure and functional uncertainty,' in M. Baltin and A. S. Kroch (eds.) *Alternative Conceptions of Phrase Structure*, 17–42, Chicago: Chicago University Press.
Karimi, S. (ed.) (2003) *Word Order and Scrambling*, Oxford: Blackwell.
Kayne, R. (1994) *Antisymmetry in Syntax*, Cambridge, MA: MIT Press.
Kempson, R. and Meyer-Viol, W. (2004) 'Indefinites and scope choice,' in M. Reimer and A. Bezuidenhout (eds.) *Descriptions and Beyond*, Oxford: Oxford University Press.
Kempson, R., Meyer-Viol, W., and Gabbay, D. (2001) *Dynamic Syntax: The Flow of Language Understanding*, Oxford: Blackwell.
Kitagawa, Y. (1986) 'Subjects in Japanese and English,' Doctoral thesis, University of Massachusetts Amherst.
Koizumi, M. (2000) 'String vacuous overt verb raising,' *Journal of East Asian Linguistics*, 9: 227–285.
Nordlinger, R. (1998) *Constructive Case*, Stanford, CA: CSLI Press.
Rizzi, L. (1997) 'The fine structure of the left periphery,' in L. Haegeman (ed.) *Elements of Grammar*, Dordrecht: Kluwer.
Rogers, J. (1995) 'Studies in the logic of trees with applications to grammar formalisms,' Doctoral thesis, University of Pennsylvania.
Ross, J. (1967) 'Constraints on variables in syntax,' Doctoral thesis, Massachusetts Institute of Technology.
Saito, M. (1992) 'Long distance scrambling in Japanese,' *Journal of East Asian Linguistics*, 1: 69–118.
Shaer, B and Frey, W. (2004) '"Integrated" and "non-integrated" left-peripheral elements in German and English,' in B. Shaer, W. Frey, and C. Maienborn (eds.) *Proceedings of the Dislocated Elements Workshop, ZAS Berlin, November 2003*, ZASPiL 35: 465–502.
Simpson, A., and Bhattacharya, T. (2003) 'Obligatory overt *wh*-movement in a *wh*-in-situ language,' *Linguistic Inquiry*, 34: 127–142.
Steedman, M. (2000) *The Syntactic Process*, Cambridge, MA: MIT Press.
Takano, Y. (2002) 'Surprising constituents,' *Journal of East Asian Languages*, 11: 243–301.