

Multiple Long-Distance Scrambling: Syntax as Reflections of Processing¹

Ruth Kempson and Jieun Kiaer

King's College London and University of Oxford

(Received April 2007; revised May 2009)

This paper argues that with syntax defined as progressive projection of semantic representations along the left-to-right dimension provided by the sequence of words (Cann, Kempson & Marten 2005), explanations for local and (multiple) nonlocal scrambling of NPs in Japanese and Korean follow from general principles of tree growth, allowing differences between the languages while nevertheless retaining an integrated account of scrambling itself. This formalism is similar to the parsing mechanism of Miyamoto (2002), but goes further in using this as the base grammar formalism, with all concepts of movement replaced by progressive articulation of structural underspecification and tree growth starting from the left periphery. The account extends the analysis of Japanese scrambling of Cann et al. to encompass multiple long-distance scrambling, capturing both the attendant relative locality restriction on the constituents moved, and interaction of this restriction with scope-construal effects. Scope-construal variability is expressible as interaction between individual lexical specifications for the two languages and general constraints on scope construal; and the relative locality constraint on the construal of the expressions involved in multiple long-distance scrambling is an immediate consequence of the general dynamics of the framework. The resulting account extends Hawkins' (2004) program of defining grammars relative to performance considerations.

1. THE CHALLENGE OF SCRAMBLING IN JAPANESE AND KOREAN

Rigidly verb-final languages such as Japanese and Korean, with freedom of NP ordering on the one hand yet rigidity of verb placement on the other, demonstrate in a particularly vivid way the gulf between articulation of grammar formalisms and models of language processing.²

- (1) jaanarisuto-ga supai-ni shorui-o watashita [Japanese]
journalist-NOM spy-DAT document-ACC handed
'The journalist handed the document to the spy.'
- (2) shorui-o jaanarisuto-ga supai-ni watashita
document-ACC journalist-NOM spy-DAT handed
'The journalist handed the document to the spy.'
- (3) supai-ni shorui-o jaanarisuto-ga watashita
spy-DAT document-ACC journalist-NOM handed
'The journalist handed the document to the spy.'

The problem is that there is unambiguous evidence of the incrementality of language processing in both Japanese and Korean, as in other languages, both from parsing and from production. These arguments have taken various forms (primarily for Japanese: Kamide & Mitchell 1999, Ferreira & Yoshita 2003, Aoshima, Phillips & Weinberg 2004, Inoue & Fodor 1995, Miyamoto 2002, Fong 2005; but see also Kiaer 2007 for Korean). Amongst the most detailed recent psycholinguistic parser specifications for Japanese is Miyamoto (2002), who argues for a parsing mechanism that involves a number of devices which enable incremental construction of structure: (i) construction of underspecified tree relations in building up a parse, (ii) constructive use of case to induce structural relations in a tree, and (iii) indication by case markers of higher phrasal boundaries, in particular by the subject marker *-ga*. Such devices as these enable detailed projections of structure to be made well before parsing the verb, as in (1)-(3). But these mechanisms fly in the face of what most grammar formalisms presume: that the verb, as head of the clause, is the element from which clausal structure is projected, an element which in verb-final languages is the final item in the clausal string. Furthermore, there is evidence of the applicability in verb-final languages of all general mechanisms such as those underlying long-distance dependency as in (4), so there is strong reason to assume that projection of core syntactic structure in these languages follows patterns shared by all other languages.³

- (4) shorui-o keisatsu-ga jaanarisuto-ga yonda to koohyooshita
document-ACC police-NOM journalist-NOM read COMP reported
'The document, the police reported that the journalist had read.'

Accordingly, the common conclusion to be drawn for all such languages is that there is only a very indirect correspondence between the language processor and the grammar formalism. The upshot is that, for verb-final languages, the development of parsing/production systems and the development of grammars have not in general gone hand in hand (though see Phillips 1996, Kempson et al. 2001, Aoshima et al. 2004, Cann et al. 2005, Kurosawa 2003, Kiaer 2007).

If the grammar formalism could be seen as nevertheless providing a natural basis for characterising the properties of the individual language in a principled way, this might seem to be no more than the familiar competence/performance distinction, in line with orthodox methodologies. But, though there may be performance considerations determining which interpretations are more marked than others, for example as dictated by pragmatic constraints such as relevance (Sperber & Wilson 1986, Carston 2002),⁴ the permutability of sentence

constituents displayed by so-called scrambling raises problems for the grammar formalism itself. On minimalist assumptions, scrambling constitutes a challenge because movement processes (or their copy-and-delete analogue) are driven by morphological features (Chomsky 1995), yet the variable ordering of NPs in verb-final languages is signally not indicated by any morphological property; and it is not obviously driven by a single interpretation-based feature either. Inevitably, debates continue as to whether scrambling is a form of A' or A movement, or neither (Miyagawa 2003, 2005, 2006). Explanations of scrambling in accordance with minimalism have placed increasing emphasis on phase by phase bottom-up projection, leaving to the side first D-structure (Saito 1992, Bošković & Takahashi 1998), then S-structure (Miyagawa 1997, Saito 2003, Hayashishita 2004), and finally also LF (Saito 2005), with all structure and pairing of interpretation argued to be phase by phase, allowing covert and overt movement operations to interact (Saito 2005, Ko 2007).⁵ This creates a problem for accounts of scrambling: the intuition that interpretation from some left-placed position involves movement back into some argument position is no longer straightforwardly expressible, because there is no longer any level of LF at which quantifier dependencies and their correspondence or non-correspondence with linear order can be expressed.⁶ Faced with this accumulation of problems, a policy of admitting partial defeat appears to be emerging, as witness the fact that arguably THE central challenge in modelling natural language semantics – the problem of quantifier scope construal and its only partial correspondence with linear order – is argued by Hayashishita (2004) to fall outside the remit of grammar-internal explanation in all cases other than those in which construal follows the linear sequence of words. Indeed he asserts that such data are to be explained in terms of some pragmatic theory that is able to account for the complex structural conditions underpinning quantifier construal that does NOT follow linear order.⁷ But no such pragmatic theory is even on the horizon: pragmatic theorising addresses questions such as to what extent general cognitive constraints minimising cognitive effort are sufficient to determine interpretation choice or whether normative constraints reflecting levels of intention recognition are also required (Grice 1989, Sperber & Wilson 1986, Asher & Lascarides 2002, Cappelen & Lepore 2005): explanations are in principle not structure-particular. Proposed explanations of scrambling that fail to address the complex interaction between apparent linearity effects and structural properties in establishing relative dependence between quantifying expressions are thus simply setting aside core data. At the very least, these issues indicate the challenge which scrambling data continue to raise.

In this paper, we respond to this challenge. We argue that a grammatical formalism in which grammar and parser are brought into much closer correspondence (Dynamic Syntax (DS): Kempson et al. 2001, Cann et al. 2005) can reflect scrambling phenomena with a directness that provides a basis for explaining how pragmatic constraints can interact with grammar-internal processes to determine correspondences between quantifier-construal and linear order, while nevertheless still sustaining the distinctness of the grammar from associated parsing and production devices. From this shifted perspective, we set out the architecture underpinning such syntax-pragmatics interaction as displayed in Japanese and Korean. The framework proposed has many similarities to the parser system advocated by Miyamoto (2002). Our central assumption is, however, that concepts of underspecification and update are taken to be the central core of the syntactic mechanism and not merely a property of some semantic or pragmatic sub-system or independently defined parser, as has been previously thought. Syntax, rather, provides the articulation of a set of constraints that underpin the progressive left-to-right construction of tree representations of content, licensing possible sequences of tree growth. The parsing system, as pragmatically constrained, then simply has to make choices within the set of possibilities which such a grammar makes available. The production system is taken to involve the same tree-growth dynamics (Purver, Cann & Kempson 2006, Cann, Kempson & Purver 2007). This framework is directly in the spirit of the move to articulate grammars in the light of performance considerations, initiated by Hawkins (1994, 2004), in particular reflecting in the grammar itself the building up of interpretation in real time.

In this paper we focus on the phenomenon known as multiple long-distance scrambling and its interaction with quantifier construal. We will argue first that by incorporating into syntax the dynamics of how interpretation is incrementally constructed, puzzles associated with quantifier construal can be explained as due to the way in which constraints on scope dependency are incrementally accumulated within the overall construction process. We then argue that the puzzles posed by multiple long-distance scrambling and its interaction with quantifier construal emerge as immediate consequences of the formal underpinnings of the overall incremental process. In particular we shall show that the parallelism of construal displayed in the variant word orderings of local scrambling and in the paired NP expressions in multiple long-distance dependency constructions emerges directly from the interaction of core tree-growth processes, a distribution which is unexpected in movement accounts of multiple long-distance scrambling. In passing, we shall show that the recalcitrant puzzle of the Proper Binding Principle – in pre-minimalist variants of syntax stated as a surface-structure constraint but more recently being side-stepped by positing multiple types of *Move α* (Grewendorf 2003) – dissolves on this new perspective, for the phenomena captured by this principle emerge as a direct by-product of the incrementality of the processing dynamics.⁸ Finally, we will argue that despite the characterisation of syntactic principles as, by definition, inducing monotonic development of partial representations of content, the framework nevertheless allows the lexical specification of idiosyncratic tree-growth properties distinguishing languages which are otherwise highly similar. In particular, the way in which subject-marking in Japanese imposes greater structural restrictions on interpretation than in Korean is reflected by a lexical encoding in at least some variants of Japanese of what is no more than a routinised pragmatic choice in Korean.

1.1 *Scrambling: the data*

The problem posed by scrambling in Japanese is not merely the apparently free permutability of the sequences of noun phrases that occur before the rigidly ordered final verb complex (as in (1)-(3)),⁹ nor even that there is long-distance dependency potential, but rather that there can apparently be more than one such expression arbitrarily far from the verb to which they have to be correlated to receive interpretation – as in (5)-(6), both of which allow an interpretation in which both the object and the indirect object expression are interpreted as arguments of the embedded verb:¹⁰

- (5) shorui-o supai-ni keisatsu-ga jaanarisuto-ga watashita to
document-ACC spy-DAT police-NOM journalist-NOM handed COMP
koohyooshita
reported
‘The police reported that the journalist had handed the document to the spy.’
- (6) supai-ni shorui-o keisatsu-ga jaanarisuto-ga watashita to
spy-DAT document-ACC police-NOM journalist-NOM handed COMP
koohyooshita
reported
‘The police reported that the journalist had handed the document to the spy.’

While (4) showed that there may be one long-distant dependent term construed from a left-periphery position in Japanese, (5)-(6) show that there may be more than one such NP, and in either order. Moreover, whenever there is more than one such NP construed cross-clausally as removed from some source site, these are subject to a stringent additional restriction: they have to be construed as local to each other, despite being an arbitrary distance away from any

verb which can provide the head to which either of them is argument. Thus in (5) and (6), the dative NP can be interpreted either relative to the matrix clause (relative to the clause of which *keisatsu-ga* is subject), or relative to the subordinate clause. Of these two interpretations, it is only the latter that is relevant to the issue of multiple long-distance dependency. And in such cases, there is no possibility of interpreting *supai-ni* and *shorui-o* as in distinct clauses: they have to be interpreted together. Thus in the following examples, there is no interpretation in which the dative NP is interpreted relative to the subordinate clause at the first level of embedding, while the object NP is interpreted relative to the second level of subordination:

- (7) *supai-ni shorui-o keisatsu-wa jaanarisuto-ga watashita to itta to*
 spy-DAT document-ACC police-TOP journalist-NOM handed COMP said COMP
koohyooshita
 reported
 ≠ ‘The police reported that the journalist said to the spy that he had handed the document to them.’
- (8) *shorui-o supai-ni keisatsu-wa jaanarisuto-ga watashita to itta to*
 document-ACC spy-DAT police-TOP journalist-NOM handed COMP said COMP
koohyooshita
 reported
 ≠ ‘The police reported that the journalist said to the spy that he had handed the document to them.’

That is, leaving aside the irrelevant matrix construal of the dative NP in each case, the only additional interpretation which (7) and (8) can have is that ‘The police reported that the journalist said (to them) that he had handed the document to the spy’. And this is so even if, as in (7), the dative expression is at the left periphery, hence higher than the following object-marked expression, under normal assumptions. Thus if two left-peripheral NPs are taken NOT to be arguments of the matrix verb but of some subordinate predicate, they must both be taken to be co-arguments of the same predicate. That this is indeed a structural condition is made clear by the fact that despite the plausibility of the precluded interpretation, it is signally not available.

These facts are essentially the same in Korean. The short scrambling data are identical in the two languages; we give two examples in both, by way of illustration.

- (9) *Jina-ka pizza-lul Mina-hanthey Pizza-Express-ese sa-cwuessta* [Korean]
 Jina-NOM pizza-ACC Mina-DAT Pizza-Express-at buy-gave
 ‘Jina bought-to-give pizza to Mina at Pizza Express.’
- (10) *pizza-lul Mina-hanthey Jina-ka Pizza-Express-ese sa-cwuessta*
 pizza-ACC Mina-DAT Jina-NOM Pizza-Express-at buy-gave
 ‘Jina bought-to-give pizza to Mina at Pizza Express.’
- (11) *Jina-ga piza-o Mina-ni Pizza-Express-de katte-ageta* [Japanese]
 Jina-NOM pizza-ACC Mina-DAT Pizza-Express-at buy-gave
 ‘Jina bought-to-give pizza to Mina at Pizza Express.’
- (12) *piza-o Mina-ni Jina-ga Pizza-Express-de katte-ageta*
 pizza-ACC Mina-DAT Jina-NOM Pizza-Express-at buy-gave
 ‘Jina bought-to-give pizza to Mina at Pizza Express.’

There is also long-distance scrambling in the two languages, both for a single expression and for a pair of expressions (as illustrated in the multiple long-distance scrambling of (13)); again we provide data from both languages:

- (13) pizza-lul Mina-hanthey Yuna-ka Jina-ka Pizza-Express-ese sa-cwuessta
 pizza-ACC Mina-DAT Yuna-NOM Jina-NOM Pizza Express at give-bought
 ko haysseyo [Korean]
 COMP said
 ‘Yuna said that Jina bought-to-give pizza to Mina at Pizza Express.’
- (14) piza-o Mina-ni Yuna-ga Jina-ga Pizza-Express-de katte-ageta to
 pizza-ACC Mina-DAT Yuna-NOM Jina-NOM Pizza-Express-at buy-gave COMP
 itta [Japanese]
 said
 ‘Yuna said that Jina bought-to-give pizza to Mina at Pizza Express.’

The NPs in such a scrambled pair (pizza, Mina) may occur in either order without any essential difference in the interpretation of the pair as a multiple long-distance dependency sequence (which, as we shall see, is a problem for Koizumi 2000); and again there is the same locality constraint imposed on multiple long-distance scrambling. The problem posed by this phenomenon is that non-locality of the dependency itself would seem to impose the necessity of positing independent processes correlating each such expression with the site of its construal; but this would leave unexplained the locality relative to each other which these expressions invariably display.

So far, the facts are relatively familiar (Koizumi 2000, Takano 2002, Saito 2003).¹¹ However, there is the additional complication: the asymmetry between Korean and Japanese judgements of long-distance scrambling. First, there is the general problem that Japanese speakers regularly report such data to be of borderline status. In Korean, however, no such borderline judgement is reported (Kiaer 2007). This is because prosodic factors can be straightforwardly used as a disambiguation device, with syllable lengthening (a characteristic feature of Seoul Korean: see Jun 2000) indicating a structural break between the expression so lengthened and whatever follows. The differences between the flexibility of scrambling in the two languages are, however, more than merely prosodic: there is a clear difference in terms of licensing for long-distance discontinuity, which affects the potential for multiple long-distance dependency pairs. *ga*-marking of subject expressions severely limits Japanese scrambling to only local variation, as reported by Saito (1985, 1992). Korean subject expressions, on the other hand, freely allow long-distance effects. Thus (15), unless highly marked emphatic intonation is used, allows only the implausible reading in which the child reports the teacher’s illness, despite the fact that this is contraindicated by the honorific form *ossyatta*, which is an inappropriate form for describing actions by a child.¹² The Korean analogue (16), to the contrary, given the honorific form of the matrix verb, unproblematically allows the reading in which the leftmost subject is interpreted as the subordinate subject:

- (15) ??sono kodomo-ga sensei-ga byooki-de gakkoo-ni ko-nai to
 that child-NOM teacher-NOM illness-of school-to come-not COMP
 ossyatta-HON [Japanese]
 said
 ‘The child said that the head-teacher had not come to school because of illness.’
 ? ≠ ‘The child, the head-teacher said because of illness had not come to school.’
- (16) Jina-ka sensengnim-i apase hakkyo-e mot-wassta ko kure-si-ess-eyo
 Jina-NOM teacher-NOM sick school-at NEG-came COMP say-HON-PAST-DECL
 [Korean]

‘The teacher said that Jina couldn’t come to school because of illness.’

This difference affects the potential in the two languages for multiple long-distance dependency effects. Korean freely allows subject expressions to occur as one of a left-peripheral pair of expressions needing long-distance construal, with the pair occurring, as in local scrambling, in either order:

- (17) tu hwanca-ssik-ul se kanhosa-ka Kim-paksa-ka pamse-tongan tolpassta
two patient-DIST-ACC three nurse-NOM Kim-Dr-NOM night-during nursed
ko kuraysseyo [Korean]
COMP said

‘Dr Kim said that three nurses looked after two patients each all night.’

- (18) se kanhosa-ka tu hwanca-ssik-ul Kim-paksa-ka pamse-tongan tolpassta
three nurse-NOM two patient-DIST-ACC Kim-Dr-NOM night-during nursed
ko kuraysseyo
COMP said

‘Dr Kim said that three nurses looked after two patients each all night.’

Japanese, however, does not. There is no analogue to these Korean data in Japanese; speakers report that the only available interpretation of (20) is that the nurses say that Dr Kim looked after two patients all night,¹³ whether the subject NP in question is initial in some putative long-distance dependent cluster of NPs, (19), or not (20):¹⁴

- (19) san-nin-no kangohu-ga kanjya-o hutari-zutsu Kim-sensei-ga
three-CLASS-GEN nurse-NOM patient-ACC two-DIST Kim-Dr-NOM
hitoban-jyuu kanbyooshita to itta [Japanese]
night-during nursed COMP said

‘Three nurses said that Dr Kim looked after two patients at different times all night.’

- (20) kanjya-o hutari-zutsu san-nin-no kangohu-ga Kim-sensei-ga
patient-ACC two-DIST three-CLASS-GEN nurse-NOM Kim-Dr-NOM
hitoban-jyuu kanbyooshita to itta
night-during nursed COMP said

‘Three nurses said that Dr Kim looked after two patients separately all night.’

Described as a movement from some canonical ordering, the lack of permutability of a subject-marked expression out of an embedded position thus appears to be sustained in multiple long-distance dependency, and furthermore sustained irrespective of the relative ordering of the paired expressions. Even for those Japanese speakers for whom such an interpretation is marginally acceptable, the data are of sharply reduced acceptability compared to the non-inverted form of construal. So whatever the basis of the relative locality restriction in multiple long-distance dependency, the requirement of locality imposed on a subject-marked expression cannot be defined merely in terms of its immediately containing environment. As we shall see, not only are these multiple long-distance dependency structures and the locally required pairing up of their construals not expressible in conventional frameworks other than by stipulation, but any move to assign such sequences to a nonstandard constituent, in order to retain the assumption of their movability and relative locality, faces the problem that there will no longer be any basis from which to predict that it is subject expressions within such left-peripheral structures that are precluded in Japanese.

1.2 Scrambling: recent analyses

This last problem is pertinent in evaluating two recent accounts of Japanese multiple long-distance scrambling within the minimalist framework: Koizumi (2000) and Takano (2002).¹⁵ In an attempt to capture the relative locality constraint on multiple long-distance scrambling for the left-peripheral sequenced NPs, Koizumi (2000) argues for an analysis involving vacuous verb movement, with subsequent leftward movement of the “remnant” propositional structure. Against this account, noting its problematic violation of the so-called Proper Binding Constraint, Takano (2002) proposes an alternative adjunct-plus-head analysis of the left-peripheral sequence of NPs, arguing that the leftmost NP in the pair (or triple) is first moved from some canonical ordering of arguments in the subordinate structure by a so-called process of *Oblique Movement*, to create an adjunct modification on the rightmost of the pair. As a result of this operation, the two NPs come to be contained within a structure immediately dominating both whose category matches the NP at the landing site, with regular *A' Movement* then applying to the composite adjunct structure. The oblique movement process is distinct from other movement processes in creating a superstructure, so that neither of the NP daughters within this super-structure c-commands the remainder string (see Takano 2002).

Neither of these analyses is unproblematic. The Koizumi account involves vacuous verb movement, a stipulation directly contrary to minimalist assumptions, effectively an unmotivated re-bracketing, with no feature-trigger either for this or for the process of so-called *Remnant Movement* that it feeds. Furthermore, as Koizumi himself notes, it predicts wrongly that anything other than canonical ordering of argument expressions in such left-peripheral pairs is not well-formed. Such a permutation of the canonical order could only be achieved by a sequence of three steps: (i) movement of what is in the surface sequence the rightmost element in the sequence of NPs out of the clause, (ii) vacuous movement of the verb, (iii) movement of the containing “remnant” VP or IP across that already-moved NP. Yet this very type of configuration is known to need debarring because of cases such as (21); it was in order to exclude structures like this that Saito (1992) introduced the Proper Binding Condition.¹⁶

- (21) [*Hanako-ga t_i iru to] $_j$ Sooru-ni $_i$ Taroo-ga t_j omotteiru
 Hanako-NOM be COMP Seoul-in Taroo-NOM think
 ‘[That Hanako is t_i] $_j$ in Seoul $_i$ Taroo thinks t_j .’

Amongst recent attempts to defuse this issue in cases where application of *Remnant Movement* apparently needs to be posited, Grewendorf (2003) has argued that *Move α* is in fact a set of rules, each distinguished by a feature, and that *Remnant Movement* is possible as long as the second apparent application of *Move α* is feature-distinguishable from the first. Koizumi, noting that his own account wrongly predicts that non-canonical orderings in multiple long-distance dependencies should be very much less acceptable than sequences in which the expressions are in canonical order (see (7)-(8)), invokes just such a Grewendorf-style analysis. But this powerful auxiliary assumption that a core rule of the grammar is in fact an open-ended set of such rules, combined with the non-minimalist assumption of vacuous application of rules, is, at best, a challenge to develop a better account, which Takano (2002) purports to provide. To add to its problematic nature, the Koizumi account signally fails to provide a basis for capturing the restriction that subject expressions in Japanese must be interpreted locally as in (19)-(20): what is moved is a remnant category (VP, TP, or CP), so there are no grounds for precluding the incorporation of a subject NP within that long-distance-moved constituent in either order, as it is not the NP constituent itself but the containing constituent that is subject to movement.

The alternative adjunct analysis of Takano (2002) might seem to be more principled, but in the event, it is not. Even in its own terms, it is no more than a formal solution, as the supposed

adjunct displays no adjunct-like behaviour other than that within the structure for which it is defined. In particular, as an adjunct, one would again expect that licence would thereby be created for pairs of subject and non-subject expressions just in case the subject is assigned adjunct status. Indeed, Takano’s major argument for this adjunct form of analysis is that it provides a basis for explaining why the adverbial *naze* (‘why’) loses what are otherwise locality constraints on its construal when it occurs within an object-*naze* sequence. But this leaves this approach open to the same problem facing the Koizumi analysis. Any subject expression that undergoes such *Oblique Movement* would as a result be nested within the adjunct structure, and accordingly should no longer display locality restrictions specific to being in a subject configuration. And, according to the Takano analysis, both canonical and noncanonical ordering of the NP sequence must be subject to *Oblique Movement* in order to create the required composite adjunct category. It is, indeed, precisely this analysis which Takano proposes for the composite focus given by the canonically ordered sequence in (22) (with first the direct object NP moving to become an adjunct to the indirect object, then that composite adjunct DO-IO being adjoined to TP, and finally, the subject NP moving to become an adjunct to the DO-IO adjunct to yield the order S-DO-IO at the left periphery as itself a composite adjunct):¹⁷

- (22) ageta-no-wa John-ga hon-o Mary-ni da
 gave-NM-TOP John-NOM book-ACC Mary-DAT is
 ‘JOHN gave the BOOK to MARY.’

Accordingly, (23) should similarly be able to have the interpretation as a fronted embedded clausal sequence, by the same compounded adjunct sequence of operations:

- (23) John-ga hon-o Mary-ni Hiromi-ga ageta to itta
 John-NOM book-ACC Mary-DAT Hiromi-NOM gave COMP said
 *‘Hiromi said that John gave a book to Mary.’
 ‘John said that Hiromi gave a book to Mary.’

But (23) only allows the interpretation in which *John-ga* is the matrix subject: it cannot be interpreted with *Hiromi-ga* construed as the matrix subject. Quite generally, as a single moved constituent, any left-peripheral sequence of NPs that is construed as involving multiple long-distance dependency has to be analysed as involving successive applications of *Oblique Movement*. Yet, as in the Koizumi analysis, such a derivation provides no basis for predicting the unacceptability of any construal in Japanese in which a subject-containing constituent in a multiple long-distance dependency structure is reconstructed into a subordinate structure because such a subject has been re-analysed as an adjunct. In any case, as Takano himself notes, the account is incomplete, since, contrary to the strict relative locality observed by all such left-peripheral sequences, nothing in his adjunct account prevents an adjoined NP from further movement once long-distance movement of the created adjunct structure has taken place, thereby predicting that a clausal adjunct may intervene between two such fronted arguments and nevertheless be interpreted as modifying the matrix verb:

- (24) ringo-o kinoo Bill-ni John-ga Mary-ga ageta to kiita
 apple-ACC yesterday Bill-DAT John-NOM Mary-NOM gave COMP heard
 ‘John heard that Mary gave apples to Bill yesterday.’
 *‘John heard yesterday that Mary gave apples to Bill.’

Because this interpretation is not available, with only the unstarred interpretation being possible, Takano suggests that it is merely processing factors that determine that only a

subordinate clause interpretation of the adjunct is possible in cases like (24). Yet the judgement that matrix construal of the adjunct is precluded is no less robust than with other multiple long-distance dependency data for which he proposes the adjunct form of analysis.¹⁸

This is by no means the end of the puzzle: there are semantic problems that are not predicted by either the Koizumi or the Takano account. In both languages there is the same high degree of variability as to what order of NPs is allowed within a single clausal sequence, and, the greater stringency of *ga*-marking in Japanese apart, whatever variability there is in the correspondence between local scrambling and interpretation is replicated exactly in the variable correspondence between NP ordering and interpretation within pairs of NPs in multiple long-distance dependency which the two languages allow. These data are the semantic counterpart to the problem for Koizumi that a switch in the order of NPs in such a left-peripheral sequence, contrary to his analysis, does not lead to a sharp drop in acceptability.

First, with object-subject order in both Japanese and Korean, there is ambiguity irrespective of choice of quantifying expression: for this sequence, there is more than one interpretation, both that in which the left-peripheral expression apparently takes wide scope over the remainder of the string, and that in which it does not:

- (25) hotondo-no uta-o dareka-ga utatta
 most-GEN song-ACC someone-NOM sang
 ‘Most of the songs, someone sang,’
 (ambiguous: indefinite narrow/wide scope)

With subject-object ordering, by contrast, there is much less flexibility, with the additional complication that individual quantifiers impose additional restrictions. A canonical ordering of subject-object-verb appears to be ambiguous if the object expression is a pure indefinite (such as *dareka* (= ‘someone’)) as in (26), but not if the subject expression is a pure indefinite and the object expression is incontrovertibly quantificational as in (27) and (28) (Kuroda 1971, Kuno 1973, Hoji 1985, Saito 1992, Tada 1993):

- (26) daremo-ga dareka-o aishiteiru
 everyone-NOM someone-ACC loves
 ‘Everyone loves someone.’ (ambiguous, narrow-scope preferred)

- (27) dareka-ga hotondo-no uta-o utatta
 someone-NOM most-GEN song-ACC sang
 ‘Someone sang most of the songs.’ (unambiguous)

- (28) nwukwunka-ka taypwupwun-ui nolay-lul pwulessta [Korean]
 someone-NOM most-GEN songs-ACC sang
 ‘Someone sang most of the songs.’ (unambiguous)

However there is a subtle interaction of pragmatic constraints, which shows that this restriction is not a rigidly structural one.¹⁹ Speakers report (29) and its analogue in Korean to be ambiguous even with the subject-object ordering: (29) and (30) allow both an interpretation reflecting linear order and one departing from it, the availability of the inverse interpretation being clearly triggered by contingent information about the circumstances described that preclude the interpretation matching linear order, despite the default prevalence of context-dependent construal for left-placed nominals (see footnote 2).

- (29) kangohu-ga subete-no kanjya-o monshinshita [Japanese]
 nurse-NOM every-GEN patient-ACC interviewed
 ‘A nurse interviewed every patient.’
- (30) kanhosa-ka motun hwanja-lul myenci-phayssta [Korean]
 nurse-NOM every patient-ACC interviewed
 ‘A nurse interviewed every patient.’

The similarity between the two languages continues with plural quantification, though the syntactic facts are somewhat different. Both languages have a distributivity marker that fixes scope relativity; the minor syntactic differences between them do not disturb the generalisation that once scoping of a quantified expression relative to another such expression is encoded, the dependency does not require linear order to bring out the requisite interpretation. Thus both (31)-(32) and (33)-(34) require the interpretation in which two patients are construed relative to three nurses so that there are six patients in all.

- (31) tu hwanca-ssik-ul se kanhosa-ka pamse-dongan tolpasseyo [Korean]
 two patient-DIST-ACC three nurse-NOM night-during nursed
 ‘Three nurses looked after two patients all night.’
- (32) se kanhosa-ka tu hwanca-ssik-ul pamse-tongan tolpasseyo
 three nurse-NOM two patient-DIST-ACC night-during nursed
 ‘Three nurses looked after two patients all night.’
- (33) kanjya-o hutari-zutsu san-nin-no kangohu-ga hitoban-jyuu kanbyooshita
 patient-ACC two-DIST three-CLASS-GEN nurse-NOM night-during nursed
 ‘Three nurses looked after two patients all night.’ [Japanese]
- (34) san-nin-no kangohu-ga kanjya-o hutari-zutsu hitoban-jyuu kanbyooshita
 three-CLASS-GEN nurse-NOM patient-ACC two-DIST night-during nursed
 ‘Three nurses looked after two patients all night.’

In the absence of such a distributivity marker, in both languages, speakers contrarily strongly prefer to attribute group interpretations to paired numerical expressions, and again linear order appears not to affect this, so that all of (35)-(37) imply that there are just two patients whom just three nurses looked after all night:

- (35) tu hwanca-lul se kanhosa-ka pamse-dongan tolpasseyo [Korean]
 two patient-ACC three nurse-NOM night-during nursed
 ‘Three nurses looked after two patients all night.’
- (36) se kanhosa-ka tu hwanca-lul pamse-tongan tolpasseyo
 three nurse-NOM two patient-ACC night-during nursed
 ‘Three nurses looked after two patients all night.’
- (37) san-nin-no kangohu-ga hutari-no kanjya-o hitoban-jyuu kanbyooshita
 three-CLASS-GEN nurse-NOM two patients-ACC night-during nursed
 ‘Three nurses looked after two patients all night.’ [Japanese]
- (38) hutari-no kanjya-o san-nin-no kangohu-ga hitoban-jyuu kanbyooshita
 two patients-ACC three-CLASS-GEN nurse-NOM night-during nursed
 ‘Three nurses looked after two patients all night.’

Bringing long-distance dependency considerations now into the picture, in both languages there is apparently conflicting evidence from quantifier construal as to the relationship between short and long scrambling. On the one hand, there is asymmetry between the interaction of quantifier and pronoun construal in short and long scrambling, suggesting that these must be distinct processes. If a quantifying expression precedes a pronominal in a non-canonical ordering within a simple clause, then that quantifier may but need not be construed as binding the pronoun as in (39) (the verb *syomeishita* in Japanese requires a dative-marked object). However, for the very same sequence of words, if the quantifying expression is part of a long-distance scrambling structure, a bound-variable interpretation is apparently precluded as in (40) (Saito 2003, 2005):²⁰

- (39) dono hon-ni-mo sono hon-no tyosya-ga syomeishita
 every book-DAT-also that book-GEN author-NOM autographed
 ‘Every book_i that book’s_i author autographed.’
 (indexical/bound-variable interpretation of *sono* both available)
- (40) dono hon-ni-mo sono hon-no tyosya-ga Hiroto-ga syomeishita
 every book-DAT-also that book-GEN author-NOM Hiroto-NOM autographed
 to itta
 COMP said
 ‘That book_i’s author said that Hiroto autographed every book_j.’
 (indexical interpretation of *sono* only)

Essentially the same distribution occurs in Korean, as illustrated by (41), which only allows the indicated interpretation:

- (41) motun haksayngtul-ul ku haksayng-ui emma-ka Kim-sensengnim-i simhake
 every student-ACC the student-GEN mum-NOM Kim-teacher-NOM severely
 ttayriesta ko cwucanghayssta [Korean]
 treated COMP insisted
 ‘That_i student’s mum insisted that Teacher Kim treated every student_j badly.’
 (indexical interpretation of *ku* only)

It might seem that this distribution can only be explained if some basis for asymmetry between short- and long-distance dependency forms of construal is posited. Yet, contrary to this, in MULTIPLE long-distance dependency the paired NPs at a long-distance remove from the verb with which they are construed are subject to exactly the same form of construal as in short-distance scrambling, the one wrinkle about Japanese *ga*-marking aside: in both languages, whatever flexibility or inflexibility there may be with pairs of left-placed NPs in simple clauses is replicated exactly in multiple long-distance scrambling. In Korean, this parallelism can be illustrated with any pairs of NPs whatsoever, in particular, given the scope-fixing properties of the distributivity particle *-ssik* (Choe 1987). Thus, just as the distributivity marker determines narrow scope of the expression it is suffixed to in both (31) and (32), so it does in (42) and (43):

- (42) tu hwanca-ssik-ul se kanhosa-ka Kim-paksa-ka pamse-tongan tolpassta
 two patient-DIST-ACC three nurse-NOM Kim-Dr-NOM night-during nursed
 ko kuraysseyo
 COMP said
 ‘Dr Kim said that three nurses each looked after two patients all night.’

- (43) se kanhosa-ka tu hwanca-ssik-ul Kim-paksa-ka pamse-tongan tolpassta
 three nurse-NOM two patient-DIST-ACC Kim-Dr-NOM night-during nursed
 ko kuraysseyo
 COMP said
 ‘Dr Kim said that three nurses each looked after two patients all night.’

Equally, the construal of the paired NPs in (35) and (36) as independent of each other and with a group interpretation carries over directly to (44) and (45):

- (44) tu hwanca-lul se kanhosa-ka Kim-paksa-ka pamse-tongan tolpassta ko
 two patient-ACC three nurse-NOM Kim-Dr-NOM night-during nursed COMP
 kuraysseyo
 said
 ‘Dr Kim said that three nurses looked after a group of two patients all night.’
- (45) se kanhosa-ka tu hwanca-lul Kim-paksa-ka pamse-tongan tolpassta ko
 two patient-ACC three nurse-NOM Kim-Dr-NOM night-during nursed COMP
 kuraysseyo
 said
 ‘Dr Kim said that three nurses looked after a group of two patients all night.’

In Japanese, where the parallelism between short scrambling and multiple long-distance dependency scope effects can only be tested with NON-subject pairs, in a simple clausal sequence, as we’ve seen, if the singular indefinite follows a quantified expression, both narrow and wide scope construal for the indefinite are freely available:

- (46) san-nin-no supai-ni shorui-o jaanarisuto-wa watashita [Japanese]
 three-CLASS-GEN spy-DAT document-ACC journalist-TOP handed
 (a) ‘The journalist handed the three spies a document.’
 (b) ‘The journalist handed a document to the three spies.’

If, furthermore, in such a pair, the singular indefinite PRECEDES the quantified expression as in (47), despite a preference for interpretations that follow linear order, this is easily set aside in cases where contingent information dictates the plausibility of one interpretation over another. For example, though the preferred interpretation of (47) is that one document is handed over to a group of three spies, (48) and (49) allow distributed and wide scope interpretations for the singular indefinite equally, in virtue of what is presumed about spies and their illegal activities:

- (47) shorui-o san-nin-no supai-ni jaanarisuto-wa watashita
 document-ACC three-CLASS-GEN spy-DAT journalist-TOP handed
 ‘The journalist handed one document to three spies.’
- (48) nise-no pasupooto-o san-nin-no supai-ni CIA-wa watashita
 forged-GEN passport-ACC three-CLASS-GEN spy-DAT CIA-TOP handed
 ‘The CIA handed a forged passport to three spies.’
- (49) san-nin-no supai-ni nise-no pasupooto-o CIA-wa watashita
 three-CLASS-GEN spy-DAT forged-GEN passport-ACC CIA-TOP handed
 ‘The CIA handed three spies a forged passport each.’

This pattern strikingly replicates itself in multiple long-distance scrambling structures. Just as there is a preferred interpretation of just one document in (47), so there is in (50):

- (50) shorui-o san-nin-no supai-ni keisatsu-wa jaanarisuto-ga watashita
 document-ACC three-CLASS-GEN spy-DAT police-TOP journalist-NOM handed
 to koohyooshita
 COMP reported
 ‘The police said that the journalist had handed just one document to three spies.’

And when this preference for linear order is over-ridden, as in (48), so in (51), it is also the reverse form of interpretation which is the preferred interpretation:

- (51) nise-no pasupooto-o san-nin-no supai-ni keisatsu-wa jaanarisuto-ga
 forged-GEN passport-ACC three-CLASS-GEN spy-DAT police-TOP journalist-NOM
 watashita to koohyooshita
 handed COMP reported
 ‘The police reported that the journalist handed a forged passport to each of three spies.’

This parallelism extends across all such pairs, with both (52) and its long-distance dependent analogue (53) having, as preferred interpretations, a wide scope construal of the indefinite:

- (52) ronbun-o gakusei-subete-ni sensei-wa setsumeishita
 article-ACC student-every-DAT professor-TOP explained
 ‘An article to every student the professor explained.’
- (53) ronbun-o gakusei-subete-ni sensei-wa jyosyu-ga
 article-ACC student-every-DAT professor-TOP assistant-NOM
 setsumeisuru-beki-da to kangaeta
 explain-PRES-MODAL-COP COMP thought
 ‘An article to every student the professor thought the assistant should explain.’

Even *wh*-questions, with their reported strict sensitivity to linear order, display obligatory wide scope for the *wh*-term for the following quantified expression, both in simple clauses (Saito 1992, Tada 1993) and in the corresponding multiple long-distance dependency structures:²¹

- (54) dono ronbun-o gakusei-subete-ni sensei-wa setsumeishita-ka
 which article-ACC student-every-DAT professor-TOP explained-Q
 ‘Which article to every student did the professor explain?’
- (55) dono ronbun-o gakusei-subete-ni sensei-wa jyosyu-ga
 which article-ACC student-every-DAT professor-TOP assistant-NOM
 setsumeisuru-beki-da to kangaeta-ka
 explain-PRES-MODAL COMP thought-Q
 ‘Which article to every student did the professor think the assistant should explain?’

As we have already seen with (19)-(20), which display subject-marked expressions that could putatively be construed as multiple long-distance dependency but which in Japanese are not, the parallelism between local permutability and permutability of pairs in multiple long-distance dependency breaks down in Japanese when one of them is a subject expression. Nevertheless, the parallelism between short and multiple long-distance scrambling otherwise holds equally for both languages.

This leaves us with an anomalous situation in which there is both indication of apparent ASYMMETRY between short scrambling and long-distance scrambling on the one hand, as

displayed in (39)-(41), but nevertheless SYMMETRY between short scrambling and multiple long-distance scrambling on the other (42)-(55). The asymmetry between short and long scrambling has been used as evidence within the minimalist literature for justifying analysing them as unrelated processes (*A Movement* on the one hand, *A' Movement* on the other). But this leaves unexplained the parallelism between short scrambling and the freedom of order of the two long-distance moved terms in multiple long-distance dependency (involving either *Remnant Movement* or *Oblique Movement*). There is, indeed, on that account, no basis for anticipating such parallelism. And the range of variability in quantifier construal is an unrelated puzzle without any obvious structural basis. However, we shall argue that, once sensitivity to the left-right dynamics of parsing is incorporated into the grammar formalism itself, the various phenomena fall into place. The phenomenon of multiple long-distance dependency will reduce to a feeding relation between the long-distance-dependency-creating mechanism and the local-discontinuity-creating process: the data are directly predicted, as is the obligatory attendant relative locality restriction of the paired NPs. The minor variation between Japanese and Korean subject marking is explicable diachronically as an encoding of routinisation in the one language of what had earlier been a pragmatically based choice. The variability of quantifier-scope construal is analysed as a systematic variability in the construal of indefinites as having to be dependent on some other term, a pragmatic choice that can be made freely with respect to whatever precedes, but only restrictedly with respect to what follows. And this account of specificity effects as applied to Japanese and Korean interacts with both the general tree-growth principles and the idiosyncratic Japanese subject marking to give us the range of data that needs to be predicted. Thus the very data which constitute a puzzle for grammars that debar any feeding relation between performance considerations and articulation of grammar architecture will be seen to emerge from the shifted set of assumptions, without structure-specific stipulation.

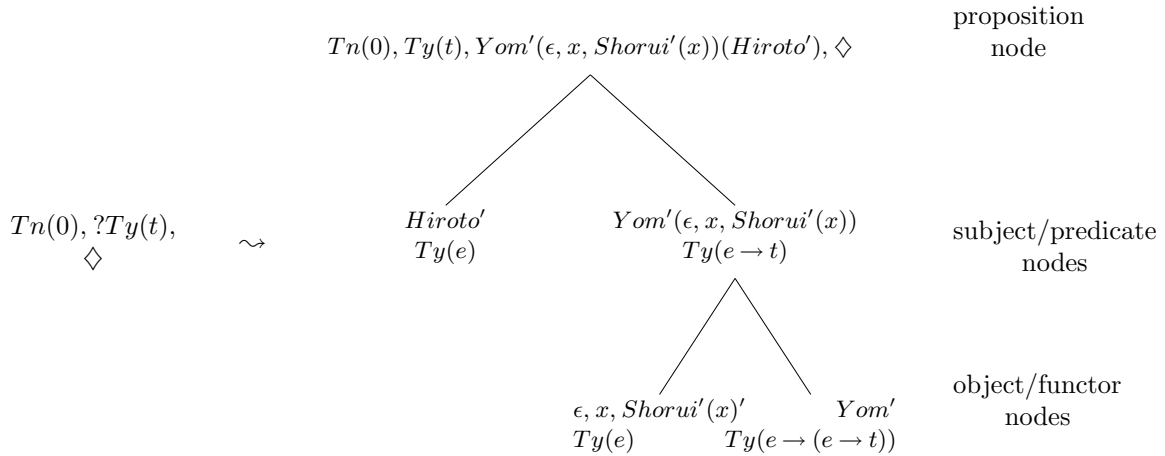
2. SYNTAX AS A PARSING MECHANISM: THE CASE OF VERB-FINAL LANGUAGES

The Dynamic Syntax model (DS) which we use as the framework for this analysis is radical in being a grammar formalism that reflects the stepwise way in which interpretation is built up during a parse sequence (Kempson et al. 2001). In this, it has many attributes in common with Miyamoto (2002); but these attributes – in particular the constructive use of case, and the structural concepts of underspecification – are here not taken merely as tools that a parsing implementation of Japanese grammar might employ, but as the underlying dynamics of natural-language syntax itself, universally available. What the grammar licenses is possible sequences of tree growth steps whereby interpretation is built up.

The process of both setting out and building up interpretation for a string is defined as a serial, monotonic process of tree growth following the order of words in a string, where the tree under development is a structured representation of the interpretation established. To yield such structures, general tree-growth procedures interact with idiosyncratic growth procedures dictated by the words, all determining a progressive build-up of structure until a fixed (in part, contextually established) interpretation is constructed. Nodes may be introduced that are identified only by a weak ‘dominated-by’ relation, and so are not immediately assigned a fixed position in the emergent tree. Establishing where in the emergent tree such a node is to get fixed is part of the construction process, with information about such a node getting passed down the tree until the site at which its relation can be taken as definitively fixed: this constitutes a major basis for noncontiguous dependencies. As the system is one that reflects the dynamics of parsing, there may be several such routes for any one string, but because this constitutes a grammar formalism, no attempt is made here to define a selection mechanism for determining how actual choices might get made within such a construction process.²² A sentence is defined to be well-formed just in case there is at least one possible route through that process which yields a semantic representation as output.

Interpretation in this framework, once established, is accordingly a tree structure which is semantically transparent: each node is decorated not with words but with a simple or complex concept.²³ Indeed, words do not inhabit the tree at all: there is no concept of structured string. A propositional formula decorates the top node of such a tree, and the various sub-terms of that formula decorate the nodes it dominates. Individual nodes are decorated with *Formula* (*Fo*), *Type* (*Ty*) values, and a *treenode* (*Tn*) label,²⁴ reflecting semantic content in terms of expressions of the epsilon calculus, a matter we return to: for example, the *formula* decoration in (56) includes the expression $(\epsilon, x, \textit{Shorui}'(x))$, which is the term-equivalent of an existentially quantified formula. Individual steps of the parser that build up these trees progressively develop a tree as schematised in the TWO trees shown in (56), reflecting the beginning and end points of the process. The starting point is a tree with just a single root-node decorated with $?Ty(t)$ indicating the requirement (the assigned goal) of establishing a formula of type t ; the intermediate steps (see 2.3.1) involve progressive partial-tree expansion; and the end point is a final binary branching tree with all nodes decorated with formula values (the trees do not reflect linear order: by convention, the functor node is always on the right).²⁵

(56) Parsing *Hiroto-ga shorui-o yonda* ('Hiroto read the document') [Japanese]
 Initial Step Final step



The concept of requirement $?X$ for any decoration X is central. Decorations on nodes such as $?Ty(t)$, $?Ty(e)$, $?Ty(e \rightarrow t)$ etc. express requirements to construct formulae of the appropriate type on the nodes so decorated (propositions, terms and predicates respectively): these requirements drive the subsequent tree-construction process. The general dynamics is to unfold a tree structure imposing such requirements, with lexical actions contributing concepts and other aspects of structure, and then compositionally with respect to that tree to determine the combination of those concepts in a strictly bottom-up fashion to yield the overall interpretation, with no requirements remaining unfulfilled. These requirements thus constitute a constraint on output, and are characteristically satisfied substantially later in the point of the derivation than the point at which they are introduced (note the introduction of $?Ty(t)$ in the first tree in (56), the onset of the derivation, a requirement which is not met until the final step of the derivation, the second tree in (56)). The process is strictly monotonic: for every well-formed sentence, there must be at least one sequence of progressively enriched partial trees from the input tree, using the actions of all the words in order, to yield some resulting tree with a logical form decorating its top node, in which all requirements imposed during the derivation are met. The logical form is a representation of content expressible by the sentence: though

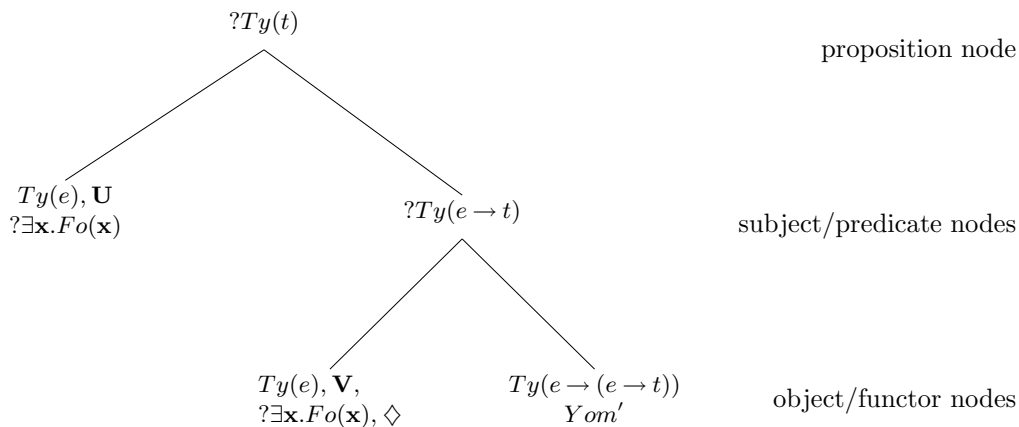
there may be a correspondence between words and concepts in so far as, for example, *shorui* yields a structure containing the predicate term *Shorui'*, words, in addition, project actions that induce the structure which such concepts inhabit; hence their specification is by definition a sequence of procedures.

The formal system underpinning the partial trees that are constructed is a logic of finite trees (LOFT: Blackburn & Meyer-Viol 1994). There are two basic modalities, $\langle \downarrow \rangle$ and $\langle \uparrow \rangle$, such that $\langle \downarrow \rangle \alpha$ holds at a node if α holds at its daughter, and the 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 (with their inverses $\langle \uparrow_0 \rangle$, $\langle \uparrow_1 \rangle$). There is also an additional *link* operator, $\langle L \rangle$, which relates paired trees, with a *link* relation from a node in one tree to the top node of another (used to build up relative clause and topic-structure construal: see Cann et al. 2005, chapter 4; Kempson, Kiaer & Cann 2009). This tree language plays a critical role in defining the individual steps of tree growth; and procedures are defined for stepwise building up of such structures either by computational actions or by lexical or even pragmatic actions. All are defined in the same vocabulary, a set of context-sensitive actions for updating representations of interpretation. Such formal tree languages by definition provide characterisations of such structural relations as *dominate*. In LOFT, as in other formal tree languages (see e.g. Rogers 1994), the concept of *dominate* is defined in the following terms: a node can be described as dominated by a node $Tn(a)$ when $\langle \uparrow_* \rangle Tn(a)$ holds at that node, that is, when the node identified as $Tn(a)$ falls along some sequence of mother relations from the present node. Such structural relations will play an important part in what follows, but we start the more detailed characterisations with sample lexical specifications.

2.1 Lexical specifications

As in other frameworks, the verb is the major projector of structure, for which actions are defined that induce some, or even all, of the propositional template they express. In Japanese and Korean, both full pro-drop languages, verbs project full propositional structure, with individual argument nodes decorated with placeholders that stand for some value to be assigned either from context or from the construction process. Such place-holders are represented as *metavariables* of the form \mathbf{U} , \mathbf{V} , .. of type e .²⁶

(57) Result of carrying out the lexical actions of *yom-* (‘read’) [Japanese]:



The effect is that verbs have a lexical specification inducing a sequence of actions which might equivalently be expressed by discrete words. The decoration of argument nodes with a metavariable, for example, is the intrinsic property of pronouns, underspecification with respect to content being their hallmark. Whether from a parsed pronoun, or from decorations intrinsic to the verb, all such placing-holding devices must be provided with an assigned value (notice the requirement for a fixed value, $?\exists x.Fo(x)$). Different types of anaphoric expressions can then be defined according to different constraints which they impose on the process. Of these, reflexives have to be updated within a given locally defined propositional structure, pronouns outside such locally defined structure, and so on (see section 2.3.1 for a tree-theoretic concept of locality). On the other hand, metavariables projected as part of the intrinsic specification of the verb lack any such restriction, and can be defined either locally or from some more general context. The account is accordingly one of intrinsic lexical underspecification, with update to these metavariables occurring either from the partial tree under construction, or from context as a step of pragmatic substitution.²⁷ Though external to the grammar formalism itself, this substitution process must interact with grammar-internal processes to ensure compositionality of content as defined over the resulting tree, for successful decoration of each non-terminal node, by definition, depends on having had all requirements on its daughters satisfied.

It might seem that this system cannot provide a representation that is transparent with respect to content because of quantification: the level at which to express syntactic generalisations across all noun phrases is very generally presumed not to coincide with the level needed to express scopal dependencies for quantifying expressions.²⁸ However, in the epsilon calculus, quantified expressions are treated as name-like, with all the force of quantification expressed as part of the evaluation of the constructed quantifying terms, a matter we return to shortly (section 2.2).²⁹ So names and quantifying expressions are all assigned actions that introduce a term of type e . In a language such as Japanese or Korean, with determiners being optional, nouns are defined as projecting the necessary conceptual structure to yield a composite type e term (like verbs projecting considerably more structure than is morphologically made explicit). The internal structure of such terms involves three parts: a binder, for example the epsilon operator ϵ analogous to the existential quantifier; a variable that it binds; and a restrictor of that variable, such as *Shorui'* (‘document’: Japanese), which in the bare noun case is simple, but which may be arbitrarily complex:

$$\epsilon, x, \textit{Shorui}'(x)$$

Such a lexical specification for a sample Japanese noun illustrates a general property of lexical specifications: the contribution of any one word to interpretation is considerably more than just the provision of some suitable logical expression. Thus, what a mere noun projects in Japanese (and Korean) is information more commonly associated with a determiner-noun sequence in a language such as English.

In general, words are taken to provide meta-linguistic instructions about the progressive setting out of structure, along with the conceptual *Formula* value that they provide for a node decoration, all expressed in the same tree-growth vocabulary as general structure-building operations. Indeed, some words may provide little more than such instructions; and this is a characteristic property of affixes. Final-placed affixes have a critical role to play in verb-final languages, since they signal the edges of phrasal constituents in the build-up of interpretation. The Japanese past-tense verbal suffix *-ta*, for example, takes as trigger a completed propositional formula of type t , with no requirements, to which a propositional operator denoting past time is added. Such a specification is no more than a transparent reflection of *-ta*'s contribution to the semantic composition of the whole. However, its effect in addition is to signal the end of the entire sequence of steps constituting the interpretation process associated with the verb to which it is suffixed. This is because the triggering condition for the update which it provides is a completed formula of propositional type; and this can only be satisfied if ALL the aspects of

interpretation needed to provide that formula have been resolved. This account notably requires the tense suffix to be processed last, and we derive verb-final ordering as a consequence.

This property of signalling the completion of structure for the word to which it is attached is not just an idiosyncrasy of the suffix *-ta*. To the contrary, it is a characteristic property of inflectional suffixes of languages which are systematically head-final; and case particles play a similar role, over and above their basic function. This basic function is to constrain the relative hierarchical position in the tree: for example, the Japanese object-marking suffix *-o* indicates that its mother node must be a predicate, i.e. it is defined as imposing a requirement $? \langle \uparrow_0 \rangle Ty(e \rightarrow t)$. By definition, this is a constraint on tree growth: the mother of such a node has to be assigned a predicate value at some point in the construction process. But in addition to this, as the last morpheme in any subtask decorating a node with a type e term, case suffixes indicate that this task is now complete. That is, by requiring some COMPLETED type e term as the triggering condition for the update that they induce, they have the effect of closing off the internal structure of that term.³⁰ In this way the compiling up of terms and propositions from their elementary parts is driven by the suffixing particles.

2.2 Quantifier scope

It might seem that this project of incrementally building up structure cannot be sustained without separating syntactic and semantic vocabulary because of the problem of scope: this aspect of interpretation just DOES need globally provided information. But this turns out to be unproblematic. Because the system adopted for representing semantic content is the epsilon calculus, scope is not represented in the tree itself but in terms of scope constraints, which are collected as they become available and are only implemented as part of a final step of evaluation of the tree once the parsing process is completed. These constraints take the form $x < y$, indicating that some introduced term binding variable x has scope over a discrete term binding y (see Kempson et al. 2001, chapter 7 for formal details): these are introduced once the relative position of the term under construction is fixed (see section 3.1). This provides a basis for expressing idiosyncratic constraints on scope evaluation which words may impose: for example, indefinites, which have well-known wide-scoping specificity effects. These are taken to project a statement of scope dependency in which the first argument of the scope relation is a metavariable, $\mathbf{U} < y$, for some scopal term binding a variable y (including terms denoting time). What this partial specification of a scope statement reflects is the fact that the choice of dependency for an indefinite is pragmatically driven (analogous to the way in which interpretation of pronouns is resolved contextually).³¹

This characterisation of scope for indefinites correctly anticipates that indefinites can be construed as dependent on ANY term already constructed in the interpretation process (e.g. from a previously parsed quantifying expression). It also provides a natural basis for two observed phenomena which Japanese illustrates. On the one hand, it covers the prevailing cross-linguistic tendency for bare indefinites positioned to the left of some subsequent quantified expression to be interpreted independently of that expression, that is as dependent only on some temporal variable as in (47) (repeated here):³²

- (47) shorui-o san-nin-no supai-ni jaanarisuto-wa watashita [Japanese]
 document-ACC three-CLASS-GEN spy-DAT journalist-TOP handed
 ‘The journalist handed one document to three spies.’

It also explains why choice of scope for a bare indefinite following another quantified expression invariably allows but does not enforce dependency on that preceding expression, as in (25), (26) and (46) (we give here (25) by way of illustration):

- (25) hotondo-no uta-o dareka-ga utatta
 most-GEN song-ACC someone-NOM sang
 ‘Most of the songs, someone sang.’

Because this choice is made on a pragmatic basis, subject to relevance (i.e. least effort) and other such considerations (Sperber & Wilson 1986), we also expect that where such linearity considerations conflict with contingent knowledge of the situation described, threatening to yield an inconsistent interpretation, they can be set aside, as in (48) and (51):³³

- (48) nise-no pasupooto-o san-nin-no supai-ni CIA-wa watashita
 forged-GEN passport-ACC three-CLASS-GEN spy-DAT CIA-TOP handed
 ‘The CIA handed a forged passport to three spies.’

Indeed, as we shall see, even in subject-object sequences of Japanese, where the subject-marking property of *-ga* forces immediate identification of a fixed subject relation, such inverted interpretations are possible if relative contingent knowledge renders the canonical interpretation implausible, as already seen in (29), which, like its English congener, allows an inverted scope interpretation:

- (29) kangohu-ga subete-no kanjya-o monshinshita
 nurse-NOM every-GEN patient-ACC interviewed
 ‘A nurse interviewed every patient.’

The restricted availability of this form of interpretation is predicted by the DS account, because there are not one but two points at which the place-holding metavariable associated with the subject expression can be identified. In (29), for example, the first point is when the expression *kangohu-ga* is parsed and an initial term with attendant scope constraint set up – i.e. at a relatively early step in the parsing process, given the order of the expressions. However, there is also a second point, and this is when the sister predicate value is completed and whatever aspects of underspecification were left open in the construal of that indefinite subject now HAVE to be resolved in order for subject and predicate values to combine to yield a properly compositional interpretation of the whole. By this late stage, when the interpretation of the subject expression and then the entire proposition is finally being established, there may have been additional quantified terms added to the accumulating set of scope statements during the build-up of interpretation of the predicate. So, as a result, a broader range of choices will have become available on which to establish the dependency of the indefinite than was available at the earlier stage when the subject expression was first parsed. This strategy of interpretation is analogous to the construal of (subject) expletive pronouns whose interpretation has to be established before the final propositional formula can be compiled, with development of the subject node occurring after the construction of the attendant predicate:

- (58) It’s likely that I’m wrong.

This analysis of expletives is argued for in Cann et al. (2005) (see also Kempson et al. 2008); and it is noteworthy that both expletive pronouns and inverted construal of indefinites are subject to the same tight locality constraint.³⁴

As we would expect from such a pragmatically driven account, these facts carry over to Korean. Inverted construal of subject and object is equally available, and is determined by context or world knowledge. Thus, despite the variability of the data, the general assumptions of the framework imply that such inverted interpretations are expected to be possible if the

first NP is indefinite, yet are predicted to be dispreferred, since they involve a selection which is not immediately resolved at the first parse point. And for all such cases where a choice is available but dispreferred, we do not define a grammar-internal mechanism for determining the choice, this being a consequence of relevance-driven considerations – though the account does provide the mechanism underpinning the availability of such interpretations. Indeed, as DS makes explicit, languages make available a range of strategies for interpretation build-up.

With so much freedom of choice in languages with very free NP ordering, it is little surprise that the languages might develop distributivity markers, narrowing down the choices that would otherwise be available, as displayed in (31)-(33). In the Korean case (*ssik*), this is defined as a nominal property, while in Japanese it is defined as a property of the constructed term as a whole, in both cases encoding the requirement of a co-occurring term in the same domain relative to which it is dependent; but given that the DS account of quantification allows idiosyncratic scope effects to be defined, such an encoding is not in principle problematic.³⁵ Overall, then, we have a principled basis for anticipating flexibility of interpretation for indefinites, as in other languages, relative to whatever individual idiosyncrasies the language may lexically impose.³⁶ As we shall now see, however, there are independent STRUCTURAL reasons for anticipating that linear order considerations do not always prevail.

2.3 Structural underspecification

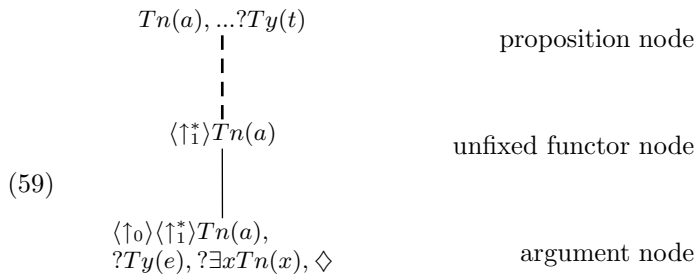
So far in this exegesis of Dynamic Syntax, the primary focus has been on lexical specifications. But the system of interpretation is far from being exclusively lexicon-driven. There are general computational actions which reflect principles of semantic tree growth that the system licenses, their intrinsic incremental dynamism being a defining characteristic of this framework. The informal observation which the analysis seeks to reflect is that expressions parsed early on in the interpretation process may fail to fully determine the role that they are to play in the overall interpretation, this becoming available only later in the parsing process (at the site familiarly known as ‘the gap’). The formal analogue of movement is to define actions that license the construction of tree relations that are not fully determined, creating an underspecified tree relation which has an associated requirement for subsequent update, that must be satisfied during the ensuing construction process. Unlike the parsing analysis proposed for Japanese by Miyamoto, or more generally so-called D-tree grammar formalisms (Marcus 1980),³⁷ the partial trees constructed by the DS formalism are part of the grammar specification. For example, long-distance dependency effects are expressed by the construction of a node from a top type-*t*-requiring node of some initiated logical structure, this new node being specified only as dominated by that top node, its position within the unfolding tree being otherwise unfixed at this point in the construal process. As indicated earlier, such nodes are annotated as $\langle \uparrow_* \rangle Tn(a)$. This is formally identical to the LFG concept of *functional uncertainty* (see Kaplan & Zaenen 1989), but unlike that notion, in the present framework, because syntactic trees are expressed in the same terms as representations of interpretation, all such underspecification is defined with an update requirement as part of the construction of interpretation. This analysis will provide a second basis for expecting delay in scope assignments, as we shall see in due course.

2.3.1 Locality variation in structural underspecification

In extending concepts of underspecification to the articulation of structure, it is natural to consider stretching the analogy between the concepts of semantic and structural underspecification yet further. Accordingly, different locality restrictions on the update process from anaphora resolution are identified, on analogy with the Binding Principles (see Cann et al.

2005, where this is justified in detail). We define one type of structural underspecification which requires update within a single propositional domain (so-called *Local *Adjunction*); another which requires update within an individual tree (reflecting strong island constraints, so-called **Adjunction*); and a third which requires update but only relative to a sequence of trees (*Generalised Adjunction*).³⁸ All such weak dominance relations, each defined in terms of a distinct modal operator, are associated with an attendant requirement that a fixed tree relation be provided as part of the construction process (expressed as $?\exists xTn(x)$). There is furthermore an intrinsic design property of the framework that is imposed by the tree logic on which it depends (Blackburn & Meyer-Viol 1994), which restricts the application of these rules. In all trees, each node is identified by its relation to every other node in the tree, each node thus having a unique set of such relations. This is completely uncontroversial for fixed tree-node relations, a node in a tree simply is uniquely defined in terms of its relation to other nodes. But it holds equally of nodes introduced by the weaker ‘dominate’ relation. There is an important consequence: there can be only one such ‘unfixed’ tree node of a type at a time in any process of tree growth. This is not a principle that has to be independently stipulated. In principle two nodes may be constructed as satisfying some underspecified tree relation to a given dominating node, hence as ‘unfixed’ with respect to that node, but with the same underspecified relation holding, the two nodes will not be distinct, and will collapse: hence the restriction that there should only be one unfixed node of a type at a time. As we shall see, this restriction imposes a particular dynamic on the way the partial trees are developed (see Kempson & Chatzikiyiakidis 2009 for details).

The process of *Local *Adjunction* applies to a type- t -requiring node. It licenses the introduction of an argument node and an underspecified functor relation, in effect a restriction on update within a given local scope domain:³⁹



What the rule induces is one fixed argument daughter node immediately dominated by a node whose relation to the node of introduction is an underspecified relation across functor relations, $\langle \uparrow_1^* \rangle$ – in effect the functor spine along which argument nodes can be constructed.⁴⁰ The node introduced by this macro of actions has a requirement for an argument term (of type e), a description of its tree relation to the point of departure, and a requirement for a fixed value. This rule is used to induce structure for local scrambling effects.

The more general process, **Adjunction*, also applies to a type- t -requiring node. It involves introducing an unfixed node to be updated within some single-tree construction. The introduced node may require either a type e or a type t formula.⁴¹

$$\begin{array}{ll}
 Tn(a), ?Ty(t) & \text{proposition node} \\
 \vdots & \\
 \langle \uparrow_* \rangle Tn(a), & \\
 ?\exists x Tn(x) & \\
 ?Ty(e), \diamond & \text{unfixed argument node}
 \end{array}
 \tag{60}$$

This more general construction process does not have the restriction that its update must be within a simple propositional structure. It is, however, defined to apply only if the tree contains no other node, and hence can only apply at the outset of inducing any proposition-requiring tree. This is the general long-distance dependency mechanism: we take this mechanism to apply equally to long-distance scrambling and to *wh*-initial structures as in English, with the latter being differentiated from scrambling by the clause-typing feature projected by the initial *wh*-expression (see section 3).

The least restricted process is a *Generalised Adjunction* process which creates a tree relation so underspecified that its subsequent enrichment can range over both dominance relations within a tree and the *link* relation between trees. This licenses a transition from a node to an unrelated node so that an adjunct structure of the same type can be built up, an unfixed node relation which allows update across even a sequence of trees:

$$\begin{array}{l}
 Tn(a), ?Ty(x) \\
 \vdots \\
 Tn(n), \langle U \rangle Tn(a), ?Ty(x), \diamond
 \end{array}
 \tag{61}$$

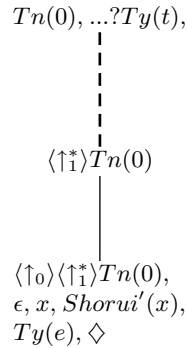
In Japanese and Korean, this transition is needed to license a move from some partially developed propositional structure onto the new development of some unrelated structure, as in, for example, construal of a relative clause immediately following an independent NP (see Kurosawa 2003, Cann et al. 2005, chapter 6, Kempson & Kurosawa 2009). In this paper, we use this rule for inducing subordinate structures in parsing a sequence of NPs (see section 3). As general constraints on tree-growth update, all these rules are in principle available from a trigger of $?Ty(t)$, so there is invariably more than one strategy for initiating the processing of a clausal sequence. At the starting point of any complete utterance, there are thus two ways of initiating growth within a tree (the two variants of **Adjunction*), and one which may turn out to be part of another tree altogether (*Generalised Adjunction*). As we shall see in section 3.1, these processes interact with quantifier construal in different ways.

2.4 Constructive use of case

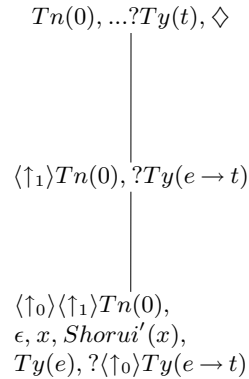
Within this network of structural growth possibilities, case plays an important role. We have so far introduced case as a filter on tree growth (e.g. accusative as requiring a predicate-node as mother). Because such specifications take the form of a requirement, they might not be satisfied until substantially later in the construction process. However, case can play a constructive role, and this is very simple to implement in this system as follows. Nothing dictates when a filter on output is met, and the filter can be used to induce the specific structural relation immediately upon decoration of the node in question, in anticipation of the relative tree position dictated

by that filter. The effect is that structure may be built up progressively before the verb is processed. For example in (62), the information provided by the case marker *-o* can be used to enrich some type-*e* node introduced by *Local *Adjunction* and so have the effect of updating the unfixed predicate relation with a fixed predicate relation, providing immediately a type-*e* tree node in the appropriate relation with which to instantiate the relevant output filter given by *o*:

- (62) shorui-o jaanarisuto-ga yonda [Japanese]
 document-ACC journalist-NOM read
 ‘The journalist read the document.’



Output of
*Local *Adjunction*
 plus term provision



Output of
 constructive case update
 by *-o*

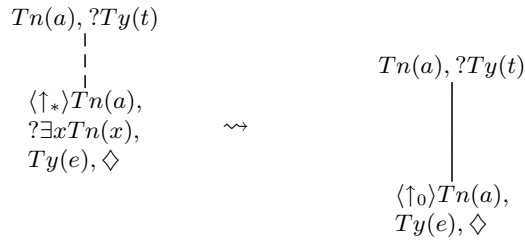
Furthermore, once this tree position is identified as an emergent object node in this derivation, we expect scope constraints to be set up directly, giving rise to the familiar preference for scope dependencies to follow the order in which the NPs occur (even in cases such as indefinites where there is flexibility and potential for delay).

It is this constructive use of case which provides a second point of comparison with Miyamoto (2002) (though Miyamoto only considers *ga*-marking in any detail). Under both approaches, because this step is an enrichment of an underspecified ‘locally-dominated’ relation, the pointer can return to the locally dominating type-*t*-requiring node, allowing the process to take place all over again. Indeed, it is notable that only if such enrichment takes place is this possible: the constraint on there being only one unfixed node of a type at a time built from a given node would otherwise preclude the construction of any further node by *Local *Adjunction*. Indeed, if iterative applicability of *Local *Adjunction* is to provide the basis for flexibly building up type *e* terms, it is essential that there be some independent process which provides the update needed to allow such subsequent re-application. With case providing a condition on output, however, such a solution is available. The enrichment which is needed to ensure that this condition is satisfied can be induced at any time, subject to restrictions of pointer movement. It can therefore take place immediately upon the return of the pointer to the dominating node, after having constructed and decorated such a locally unfixed node. This form of update means that the NPs themselves can be processed in any order: each one will introduce the particular substructure needed for its own output, and each structural relation can then be fixed at once by enrichment. The actions of the verb then serve to complete the requisite structure.⁴² There is no reflex of word displayed by the resulting tree, so no matter what

order the NP argument expressions occur in, the same result will obtain. Hence the essential correlation between free intra-clausal permutation of NPs and constructive use of case.

With case in Japanese seen as in principle playing both filtering and constructive roles, it is straightforward to specify the update induced by the stringent idiosyncrasy of subject marking in Japanese – in movement terms, reported as precluding long-distance movement (Saito 1985). Seen from a parsing perspective, we can define *-ga* as having ONLY a constructive case mechanism: the fixing of the structural relation is immediate, and the alternative of merely imposing a relatively weak output filter is not available. The effect is that *-ga* identifies a boundary edge for a local propositional domain wherever it occurs in an NP sequence. Accordingly, we define it as taking as input a node introduced by application of either **Adjunction* or *Local *Adjunction* and fixing the relation to one of immediate dominance (note that the input condition is simpler than for the construction subcase of *-o*, applying to any node which is unfixed and yielding a fixed subject relation):

(63) *-ga*:



This forced update applies to all nodes created by either *Local *Adjunction* or **Adjunction* which *-ga* decorates, and accordingly yields a boundary-marking effect in all clausal sequences. This boundary-marking role will not be available to the other case-marking suffixes, since the dual function of other case specifications ensures that they will not themselves provide a deterministic parsing clue for identifying a propositional constituent boundary (though there might of course be other considerations giving rise to such an effect).

This tight correspondence between subject marking and immediate fixing of a local subject relation does not carry over to Korean, which freely allows the use of subject-marked expressions in long-distance dependency, as we saw earlier with (43):

- (43) se kanhosa-ka tu hwanca-ssik-ul Kim-paksa-ka pamse-tongan tolpassta
 three nurse-NOM two patient-DIST-ACC Kim-Dr-NOM night-during nursed
 ko kuraysseyo
 COMP said
 'Dr Kim said that three nurses each looked after two patients all night.'

Korean subject-marking thus retains the weaker output-filter characterisation of case-marking, shared by all other case-markers. Nonetheless, like all other case markers, enrichment of the introduced node decorated by the subject marker *-ka* has to take place yielding a fixed subject relation if some subsequent case-marked expression is to be processed as providing some local argument, and for just the same reason as in Japanese: only one unfixed node of a particular type can be constructed from a given node at any one time. Thus the only feature essentially differentiating subject marking in Japanese and Korean is that in Korean, such enrichment is a routinised strategy – often used, hence arguably a default, but overrideable. In Japanese, by contrast, such a strategy has become fully encoded.

A putative counter-example to this account of local scrambling, and in particular to the account of *ga*-marking and its enforced locality, are examples in which a left-peripheral *-ga*

marked NP is interpreted as a subordinate subject immediately followed by a matrix subject marked with the topic-marker *-wa*, making it appear that the *ga*-marked expression should be taken to modify an unfixed node that is resolved into a subordinate structure by the same mechanism as other case-marked NPs:

- (64) Saito-ga Chomsky-wa tottemo ii riron-o motteiru to omotteiru
 Saito-NOM Chomsky-TOP very good theory-ACC has COMP thinks
 [Japanese]
 ‘Chomsky thinks that Saito has a very good theory.’

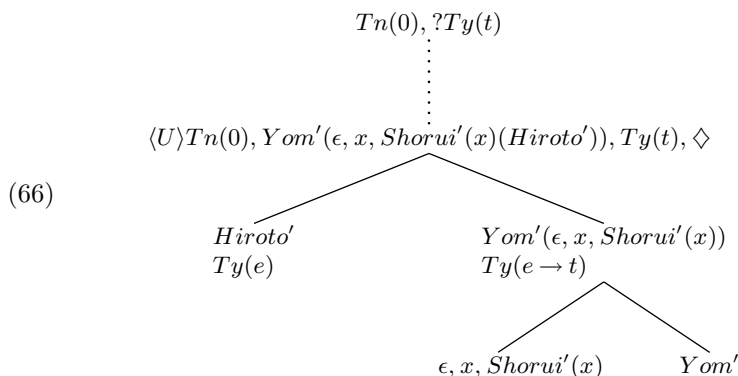
However, in other work (Cann et al 2005, Kempson et al. 2009), we have argued that topic-marked expressions decorate a so-called *linked* structure, a quasi-independent structure correlated with the primary structure solely through imposed identity of construal for the topic-marked expression and one of the arguments in the primary structure.⁴³ Given such an account, the *wa*-marked expression in (64) can be associated with the construction of the *linked* structure from the initial subject-induced node decorated by *Saito-ga*.⁴⁴ This strategy allows the interrupted sequence of *Saito-ga tottemo ii riron-o motteiru* to be analysed as projecting a local array of arguments plus predicate at the appropriate level of embedding, through initial use of *Generalised Adjunction* (see section 3.2). On this analysis, the interpretation of (64) would be more faithfully reflected by the gloss ‘As for Chomsky, Saito has a very good theory, he thinks.’⁴⁵ So the analysis of *-ga* as immediately determining a propositional boundary edge by fixing a subject relation can be preserved. The availability of this additional strategy applies equally in Korean, although since subject-marking in Korean is no different from other case relations, the preference for constructive case construal is due to general processing-cost considerations (Kiaer 2007).

2.5 Complement clause construal

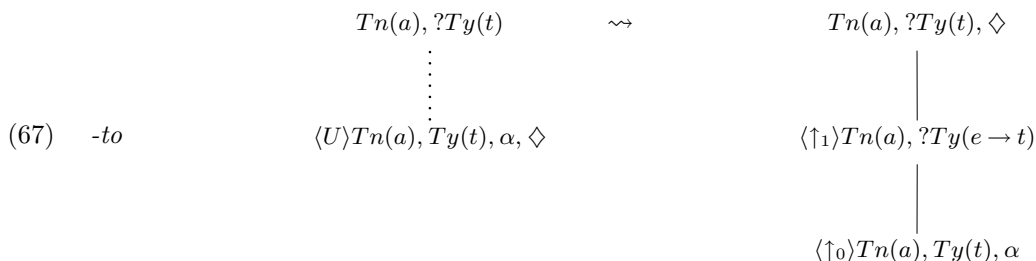
To extend the account of local projection of structure to the projection of subordinate structure, all that is needed is to define the suffixed complementiser *-to* as following the general pattern of inflectional suffixation, inducing the completion of the formula of propositional type, the end of whose construction it signals. This is formally reflected by imposing, as condition on its update, the necessity of having as input some completed propositional formula, with no subsequent revision allowed. To see this effect, we need to examine how the construal of a simple clausal sequence is incorporated at some arbitrary level of embedding.

- (65) Hiroto-ga shorui-o yonda to itta
 Hiroto-NOM document-ACC read COMP said
 ‘Hiroto said he read the document.’

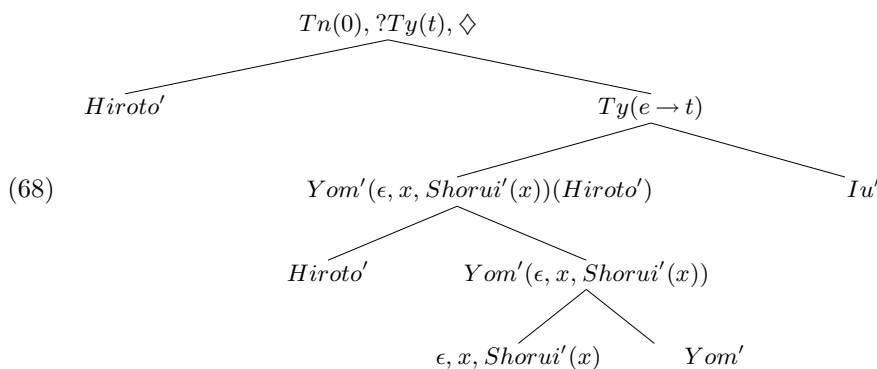
As we saw earlier, *Generalised Adjunction* is a very general mechanism for initiating one structure from another of the same type requirement, with no indication of level of embedding of that introduced new node or even whether the propositional tree it introduces will be within the same tree as the root. It thus cannot provide any basis for application of enrichment by *-ga* to yield a fixed matrix subject relation: the only enrichment available will thus be to induce the subject node of the local platform type-*t*-requiring node which *Generalised Adjunction* introduces. With this now presumed as a possible initial step from the assigned goal, the sequence of actions for projecting some simple propositional structure in parsing a subordinate sequence can be seen as otherwise identical to that involved in processing an independent simple clausal sequence (suppressing the scope statement of the complement structure):



Thus *-to* has to be defined (in standard Japanese, where it is obligatory) in such a way as to determine the nesting of the propositional structure. This can be done in one of two ways: either by adding a further intermediate node locally dominating the node just completed, or by making use of the very weak structural relation already induced, returning the pointer there, and enriching the relation to that of local subordination ($\langle U \rangle$ is the weakest subordination relation of all, indicating an arbitrary level of embedding, even across linked trees):



For present purposes, the primary significance of these actions is that, following the regular pattern of suffixes, the condition necessary for either of the two kinds of licensed update given *-to* is that the node should be decorated with a completed type t . The effect of this condition is to ensure the prior decoration of all non-terminal nodes which that node dominates (including nodes for which there is no explicit natural-language expression). What *-to* then imposes is obligatory subordination. The result of carrying out these actions is that some subsequent verb can project its actions; in (65) this is the verb *itta*, for which the propositional template already constructed from the parsed string *Hiroto-ga shorui-o yonda* provides its object argument:



Finally, in this particular parse of (65), the subject argument can be identified anaphorically as *Hiroto'*, to yield (as before, suppressing tense):⁴⁶

$$Iu'(Yom'(\epsilon, x, Shorui'(x))(Hiroto'))(Hiroto')$$

This narrated sequence of actions may seem little more than a tutorial demonstration of a DS derivation; but there is more to it than this, for the so-called Proper Binding Condition effect, which, in movement accounts, has to be imposed as an additional constraint on processes of movement, now emerges as an immediate consequence, a mere side-effect of the account of head-marked suffixes in general as term-closure devices. The problem for minimalist, as for other movement accounts, is that data such as (69) (cited in section 1.2 as (21)) are on the face of it predicted to be well-formed since, given general principles of movement and no further auxiliary hypothesis, nothing precludes leftward movement of an NP out of its containing clause to an adjunction site, following by leftward movement over that adjunction site of what had been its containing clause, yielding (69):

- (69) [*Hanako-ga t_i iru to] $_j$ Sooru-ni $_i$ Taroo-ga t_j omotteiru
 Hanako-NOM be COMP Seoul-in Taroo-NOM think
 ‘[That Hanako is t_i] $_j$ in Seoul $_i$ Taroo thinks t_j .’

But (69) is sharply ungrammatical.⁴⁷ Some additional assumption or set of assumptions thus had to be created – hence the added filter defined as the Proper Binding Condition. On the Dynamic Syntax set of assumptions, to the contrary, there is no question of ever generating the sequence indicated in (69): the parsing of the sequence ending with *-to* in (69) has to have been construed as a completed propositional formula in order to license the update provided by *-to*, and hence would have to have had the argument of *iru* provided in context. Parsing *Sooru-ni* following the parsing of *to* as modifying the embedded structure is precluded. There is no going back of the pointer: once that structure is completed, the only possibility would be to construe *Sooru-ni* as a dative argument to *omotteiru*, but this is independently excluded. In (70), by contrast, the full sequence of expressions needed to interpret the clausal sequence ending with *-to* allows a propositional structure to be routinely completed, and this then serves as the internal argument of *omotteiru* – all exactly as expected:

- (70) Hanako-ga Sooru-ni iru to Taroo-ga omotteiru
 Hanako-NOM Seoul-in be COMP Taroo-NOM thinks
 ‘Hanako is in Seoul, Taroo thinks.’

For similar reasons, the occurrence of a dative-marked NP following *-to*, as in (71), must be interpreted relative to the matrix subject, and not within the subordinate structure:⁴⁸

- (71) jaanarisuto-ga shorui-o yonda to keisatsu-ni supai-ga itta
 journalist-NOM document-ACC yonda COMP police-DAT spy-NOM said
 ‘The spy said to the police that the journalist read the document.’
 ≠ ‘The spy said that the journalist read the document to the police.’

The significance of this account for the ongoing debate over the Proper Binding Condition is that, according to the account provided here, the data are epiphenomenal – not because the data are contrary to what has been observed by many (pace Hiraiwa 2005), but because the effect of the Proper Binding Condition follows as an immediate consequence of the unfolding dynamics, in particular the effects in the closing stages of compiling some emergent structure as imposed by strict compositionality of the resulting tree.⁴⁹ Moreover, on this account, this effect

is not a constraint to be defined specific to clausal structure itself, or with respect to how that is built up, but is a consequence of the very general role of suffixes in a head-final language, that they define the end-point in a local term-construction process.

3. LONG-DISTANCE SCRAMBLING

Despite the faithful way in which the analysis so far reflects linear processing, the whole account might appear to be jeopardised by reconstruction effects showing that the interpretation of a left-peripheral expression may, and in some cases must, be in some sense delayed (as in (40)):

- (40) dono hon-ni-mo sono hon-no tyosya-ga Hiroto-ga syomeishita
 every book-DAT-also that book-GEN author-NOM Hiroto-NOM autographed
 to itta [Japanese]
 COMP said
 ‘That book’s author said that Hiroto autographed every book.’

This effect is general in the two languages. Indeed, these phenomena and analogous data containing anaphoric expressions in the left periphery have been taken as evidence that no linearity story of quantifier and anaphora construal is possible (see Mahajan (1997), among others). Given the perspective of tree growth, however, such a conclusion needs to be reconsidered.⁵⁰

Long-distance dependency phenomena constitute the canonical case for which the DS formalism defines the construction of a node with no fixed tree relation but only a relatively weak dominance relation, as in (4):

- (4) shorui-o keisatsu-ga jaanarisuto-ga yonda to koohyooshita
 document-ACC police-NOM journalist-NOM read COMP reported
 ‘The document, the police reported that the journalist had read.’

A left-peripheral NP is interpreted as decorating an initially introduced unfixed node, with the construction process licensed to continue with the unfolding of emergent structure from the dominating node.⁵¹ Such emergent structure is provided by verbs, with attendant argument nodes providing candidates for unifying with the unfixed node. Once some candidate node is identified, the requisite unification step can take place.⁵² Here is where case as an output filter plays a role, as it imposes the requirement that the fixed argument node must match whatever positional requirement may be imposed by the unfixed node’s case specification; and all case specifications which allow a case-marked expression at the left periphery to be associated with some subordinate structural position across a matrix-construed subject expression are defined as having such an output-filter function. Unlike the constructive role of case, whenever the case specification serves merely as a constraint on update, e.g. of the form $?(↑_0)Ty(e \rightarrow t)$ for accusative, there will have to be some OTHER action inducing the necessary node before the update action to satisfy the case requirement can take place. Hence the implementation of case-update filters in conjunction with the processing of a verb.

3.1 *Cross-clausal quantifier construal*

This account of long-distance scrambling gives rise to the following expectation. Given that such a left-peripherally constructed term is not initially assigned a specific structural position

in the configuration of emergent semantic structure, any outstanding update requirements for the term decorating that node, which need a fixed tree position in order to be resolved, cannot be resolved until this requisite fixed tree-node position has been identified. This affects scope construal in particular. The assignment of relative scope dependency for a term decorating a node introduced by **Adjunction* can only take place once the update process has occurred which fixes that node within the tree. So, in (40), the quantifying expression *dono hon-ni-mo* is first taken to decorate an unfixed node; and the position of this node must then be fixed BEFORE the scopal property making it a complete quantifying term can be determined:

- (40) dono hon-ni-mo sono hon-no tyosya-ga Hiroto-ga syomeishita
 every book-DAT-also that book-GEN-also author-NOM Hiroto-NOM autographed
 to itta
 COMP said
 ‘That book’s author said that Hiroto autographed every book.’

However, the interpretation of the immediately subsequent *sono hon-no tyosya-ga* as matrix subject will be fixed immediately upon processing the suffix *-ga* because of the constructive use of case, so its containing anaphoric expression will also get fixed before the scopal property of the quantifying expression that would make it viable as an antecedent can be determined. So *sono hon-no* in (40) is interpreted indexically.⁵³ Hence the cross-clausal reconstruction effects of (40) associated with quantifier construal for some left-peripheral quantified expression emerge as a consequence of the specific tree-growth perspective: while the unfolding of interpretation is strictly incremental with respect to the structural process itself, nevertheless, in defining systematic underspecification of relations and formulae within that perspective, there is leeway for systematic delay in compositionality of content in all such cases.

This analysis provides a basis for explaining the asymmetries between short- and long-distance scrambling environments in their licensing of scope construal for quantifying expressions. In individual clausal sequences (where NPs occur in any order), the node for each NP to decorate will be introduced as an unfixed node, but its tree relation will be updated as soon as the decoration of that node is complete – with the result, as we have seen, that assignment of scopal dependence for a quantifying expression takes place incrementally. There is a stronger result in Japanese when the subject expression is initial, as the underspecified unfixed node which it decorates will in Japanese always be updated immediately (ensured by the processing of *-ga*, which encodes this action directly). In such a case, we expect that unless there is reason to override the reliance on the linear order in which the words are presented, a possibility in any case only available with indefinite expressions, construal of quantifying expressions will follow linear order, yielding the already-noted judgement of (27) as unambiguous:

- (27) dareka-ga hotondo-no uta-o utatta
 someone-NOM most-GEN song-ACC sang
 ‘Someone sang most of the songs.’ (unambiguous)

However, when an expression with any case-marking OTHER than subject-marking is initial, both **Adjunction* and *Local *Adjunction* strategies will be available; and since the second of these operations licenses IMMEDIATE fixing of the node constructed, and the first, conversely, licenses DELAY in fixing the node constructed, both interpretations are expected to be available. And so we get the much freer availability of non-inverted and inverted interpretations with object-subject ordering in local scrambling, as in (39) and (25):

- (39) dono hon-ni-mo sono hon-no tyosya-ga syomeishita
 every book-DAT-also that book-GEN author-NOM autographed

‘Every book_i that book’s_i author autographed.’
(indexical/bound-variable interpretations of *sono* both available)

- (25) hotondo-no uta-o dareka-ga utatta
most-GEN song-ACC someone-NOM sang
‘Most of the songs, someone sang.’
(ambiguous: indefinite narrow/wide scope)

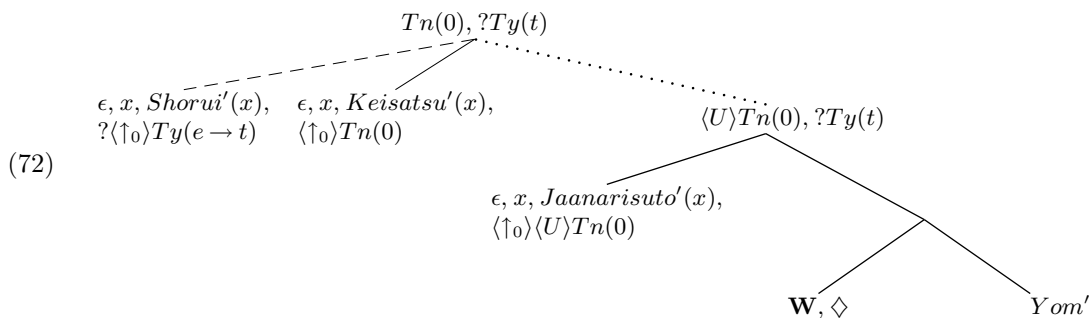
In Korean, scope effects involving the subject are arguably weaker, being only a consequence of pragmatic pressures. But, in all cases, interpretations which go against linear order require the distinctive intonation indicating delay in construal of the quantified expression.

3.2 Implementing long-distance scrambling effects

In setting out our account of long-distance scrambling phenomena, we have not yet spelled out the mechanisms for constructing nested complement structure prior to the processing of the requisite verb. The problem that these structures appear to pose is that the one initially unfixed node which the left-peripheral expression decorates apparently has to be passed across what would seem to be a sequence of unfixed nodes for each of the argument expressions, since the verb will not yet have been parsed:

- (4) shorui-o keisatsu-ga jaanarisuto-ga yonda to koohyooshita
document-ACC police-NOM journalist-NOM read COMP reported
‘The document, the police reported that the journalist had read.’

At this point, the constraint of having only one unfixed node of a type at a time comes into play (see section 2.3.1). Though more than one underspecified tree relation can be constructed as long as a distinct adjunction rule is made use of (since the three adjunction rules involve distinct modal relations), the same computational action cannot be used more than once. In this derivation, the expression *shorui-o* decorates an unfixed node, as introduced by **Adjunction*, but this does not preclude parsing of *keisatsu-ga* as this is associated with introduction of a locally unfixed node which its subject specification duly fixes as matrix subject. The immediately following *jaanarisuto-ga* must then be taken to decorate a discrete subject node at some level of embedding. The problem is that **Adjunction* has already been used in the construction of the node decorated by *shorui-o*, so it cannot be used to license the introduction of a node to host the embedded structure, as this would simply collapse with that still unfixed node, with no possible way of completing a well-formed derivation. The only solution available is to use the weakest form of transition, *Generalised Adjunction*, to construct the embedding relation. But this is not problem-free, since application of *Generalised Adjunction*, which introduces the very weakest of embedding relations, yields a structural relation which is too weak to license unification of the unfixed node originally introduced by **Adjunction* with any subsequently introduced node:⁵⁴



The problem is that *Generalised Adjunction* is not an operation which would introduce structure that could provide an update of the tree relation introduced by application of **Adjunction*, here the node decorated by $\epsilon, x, Shorui'(x)$, since the tree relation it introduces is so weak, weaker even than that introduced by **Adjunction*.

This may seem to enforce a characterisation of all such strings as incapable of yielding a logical form as a result, hence ungrammatical. Yet there is a simple and monotonic repair process. The formal system is independently defined to allow interspersing of pragmatic substitution processes with building of partial structures – the enrichment of formula values by substituting a metavariable with some appropriate part term is taken to feed into the general construction process. All that is needed to ensure that the partial structures constructed up to this point lead to a well-formed result is to assume that pragmatic enrichment can apply to structural underspecification. This is hardly contentious: enrichment of stimuli is a general cognitive phenomenon (see Sperber & Wilson 1986, among others), not one specific to a certain mode of representation. More specifically, what is required to yield a well-formed derivation for (4) is to introduce the requisite weak tree relation by *Generalised Adjunction*, and then, having done so, to enrich it to a fixed relation, transforming the emergent partial tree into one with a relation of immediate subordination between the structure in which the newly constructed term $\epsilon, x, Jaanarisuto'(x)$ is contained (established by the processing of *jaanarisuto-ga*) and the matrix structure. Formally, the node identified as $\langle U \rangle Tn(0)$ is updatable to $\langle \uparrow_0 \rangle \langle \uparrow_1 \rangle Tn(0)$.⁵⁵

The problem with this step of enrichment is that it is not morphologically triggered: it is an abduction step that is triggered solely by recognition that without some such step, no successful derivation will result – hence a meta-level step of reasoning. Being a pragmatic and optional process, any such choice should be expected to be associated with general cognitive constraints. And indeed, as an account invoking some intermediate step of abduction would anticipate, it is commonly reported that long-distance scrambling data are of reduced acceptability when considered in isolation, and are only possible if uttered in a particular type of context (e.g. in answer to a question with fronted *wh*-expression). Indeed, given that such front-positioning forces the evaluation of the unfixed node across a sequence of partial trees until its tree relation can be fixed, we expect this to be a marked option, and indeed it is invariably associated with a particular form of intonation (Saito 1985, 1992, Koizumi 2000), using an Intonational Phrase boundary indicating a constituency break so as to disambiguate in favour of such a strategy.⁵⁶

With this account of long-distance dependency in verb-final languages in hand, we return to the differential status of Japanese and Korean subject marking. That Korean subject marking freely allows long-distance dependency is captured in the fact that it identifies some subject expressions only in terms of an output filter and so is commensurate with an embedded construal:

- (16) Jina-ka sengnim-i apase hakkyo-e mot-wassta ko kure-si-ess-eyo
 Jina-NOM teacher-NOM sick school-at NEG-came COMP say-HON-PAST-DECL
 [Korean]

'The teacher said that Jina couldn't come to school because of illness.'

This option of delaying subject construal via use of **Adjunction* is not open to Japanese because, although application of **Adjunction* is available, the specification of *-ga* forces the construal of that term as subject within the very structure from which that unfixed tree relation was built (hence at the root as matrix subject), as we saw earlier.

This might seem to imply that Korean word order allows generally greater freedom of construal than Japanese, but apart from the stringency of subject construal in Japanese, the not unrestricted freedom of argument placement in the two languages is similar.⁵⁷ This is because, while there is very great freedom in simple clauses, there is far less freedom as soon as there is co-construction of matrix and embedded structures. Take, for example, the construal of two nominative NPs in sequence reflecting matrix and subordinate subject respectively. This is always possible so long as selectional restrictions are appropriately satisfied, though it is in fact dispreferred, since it is much more natural to place the matrix subject and any attendant adjuncts so that this sequence of expressions immediately precedes the verb predicated of them. However, there are consequences to a marked choice of this sort. Because **Adjunction* itself can only apply if there is no other structure from the initiating node, the only way to introduce the subordinate structure after the construction of a matrix subject node is via *Generalised Adjunction* introducing a radically unfixed node with a type *t* requirement, *?Ty(t)*. Once the pointer has moved to this node, there is no return to any superordinate structure until that substructure is complete: pointer-movement back from one node to another is possible only if the nodes in question are type-complete, and for all fixed structures there is a strict compositionality requirement that type-requirements on a mother node can only met by type-deduction and functional application applying to their daughters. What this means in the derivation of embedded structures in a verb-final language is that all NP expressions following the introduction of the relevant substructure have to be construable as contained within it until the verb that will enable it to be completed has been processed. For example, in (16), the adjunct cannot be construed as indicating that 'The teacher said at the school that Jina was sick and not coming'. This restriction is quite general. With the single exception of the ability to build and decorate an unfixed node at the outset of creating some root structure, once there has been some indication of a break in local-structure building to start the construction of some appropriate subordinate structure,⁵⁸ there is no return to higher levels of structure until that more subordinate structure is completed. Such restrictiveness is built into the licensing of pointer movement: there is strict compositionality of any sub-structure, and no licensing of switching to and fro, from matrix to subordinate structure and back again, within the setting out of that substructure. The only licensing for such apparent freedom is at the left periphery, where an underspecified tree relation can be constructed, and that too must have a secured type specification before the parsing process can proceed from the development of that node. The co-implementation of **Adjunction* and *Generalised Adjunction* thus correctly imposes strict subordination on all remaining NP-expressions in the sequence. These facts are common the two languages. Thus, despite minor lexical variation in license of constituent order variation, the dynamics of how the major tree-building processes interact is identical.

4. MULTIPLE LONG-DISTANCE SCRAMBLING

In all derivations so far, there has been largely tacit agreement that the restriction of only one unfixed node at a time is sustainable. It is now time to put this assumption to the test. It was, recall, a consequence of the tree logic that all nodes, even ones in an underspecified relation, are uniquely identifiable by their hierarchical position within a tree, by definition of what it means to be a tree. However, it might seem to the contrary that the centrality of this constraint to

the DS system faces a serious counterexample in multiple long-distance scrambling phenomena, since these display long-distance dependencies involving more than one expression:

- (5) shorui-o supai-ni keisatsu-ga jaanarisuto-ga watashita to
 document-ACC spy-DAT police-NOM journalist-NOM handed COMP
 koohyooshita [Japanese]
 reported
 ‘The police reported that the journalist had handed the document to the spy.’

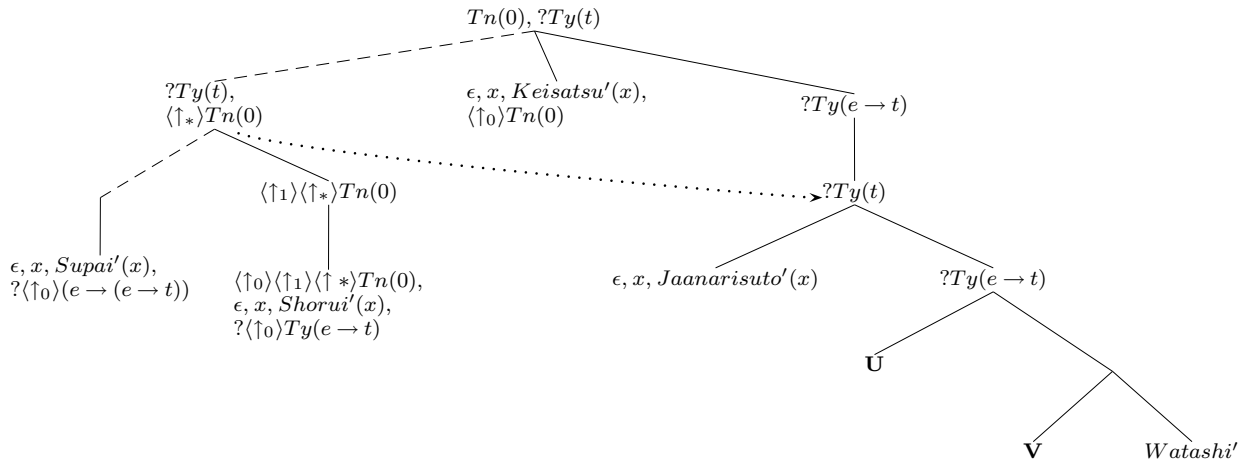
- (42) tu hwanca-ssik-ul se kanhosa-ka Kim-paksa-ka pamse-tongan tolpassta
 two patient-DIST-ACC three nurse-NOM Kim-Dr-NOM night-during nursed
 ko kuraysseyo [Korean]
 COMP said
 ‘Dr Kim said that three nurses each looked after two patients all night.’

To press the point, if these data are robust and the constraint is thus unsustainable, with the underlying concept of tree under threat, such data would constitute serious putative counterevidence against the Dynamic Syntax framework itself. However, in fact, such data provide strong confirmation of the constraint dictated by the tree logic, and hence of Dynamic Syntax; the data are directly predicted by the general framework, including the variation between closely related languages. Independently motivated is the assumption of three discrete processes for introducing structurally underspecified relations into the emergent tree – *Local *Adjunction*, **Adjunction*, and *Generalised Adjunction*. With these as independent processes, there is nothing to prevent a feeding relation between them. In particular, nothing prevents the process of **Adjunction* from feeding the process of *Local *Adjunction*, with the construction, from what is itself an unfixed node within some overall structure, of a substructure of argument nodes awaiting a predicate node. Such a sequence of operations involves the construction at the left periphery of an unfixed node requiring type *t*, from which successive steps of *Local *Adjunction* with case-provided update can induce a partial propositional structure (containing two argument nodes but no predicate node) – an incomplete structure which is then left to be resolved later once some appropriate nested structure is made available (pointer movement back to the dominating node is licensed for all unfixed nodes that are type-complete). This is precisely the unfolding derivation of structure which (5) and (42) display, as we now see.

Such data are notably not a problem for the uniqueness constraint on unfixed nodes which the DS account imposes, despite the existence of more than one expression at an apparent long-distance remove from the verb with whose argument nodes these ‘displaced’ nodes need to unify. There is only one node introduced by **Adjunction*, a node decorated by $?Ty(t)$; but it is from this node that argument nodes get constructed by *Local *Adjunction* and enrichment, yielding the effect of multiple long-distance dependency.⁵⁹ The actions needed for the parse of (5) are as follows. Following an opening step of **Adjunction*, which creates an intermediate unfixed type-*t*-requiring node, the first two NPs in the left-peripheral sequence of NPs are both taken to be associated with the building and decorating of a node constructed from that intermediate node by a step of *Local *Adjunction*. The case specification of the first of these is taken to be construed constructively, which fixes the relation of the newly built, locally unfixed type *e* node to its locally dominating node. For the second NP, however – the last in the sequence to follow this pattern, as it happens – the case specification is construed as a filter on output, enabling the pointer to return from the second type *e* node to the top node, leaving that node as unfixed both locally to its intermediate dominating node and to the higher dominating node (see (73)).⁶⁰ What then follows is the regular process of introducing a matrix subject node (from the first *ga*-marked expression, *keisatsu-ga*, by application of *Local *Adjunction* and the fixing of the subject relation); the use of *Generalised Adjunction* to introduce an unfixed

level of embedding; and one further process of introducing a subject relation in order to parse the second subject-marked expression, *jaanarisuto-ga* – all this exactly as in the building-up of regular long-distance dependency. Once the second *ga*-marked expression is parsed, the very same problem arises as in regular long-distance dependency. Unless the very weak tree relation between the type-*t*-requiring node and the root is enriched, the unfixed node introduced initially will not be able to filter down the tree. And the same solution is available as in construal of regular long-distance dependency – to assume that the very weak relation $\langle U \rangle Tn(0)$ is enriched to $\langle \uparrow_0 \rangle \langle \uparrow_1 \rangle Tn(0)$ (or, more weakly, to $\langle \uparrow_* \rangle Tn(0)$). With this, the parsing of the verb *watashi* can then take place, as in a simple clausal sequence, to complete the setting out of the subordinate predicate-argument frame; and a complement propositional formula can be duly derived by unifying the unfixed node (with its two arguments) with this complement node:

(73)



From this point on, the complement structure can be compiled as in the simpler long-dependency structure, and a final derivation for the entire string is completed. Since this is an interaction between general structural processes of growth, we correctly expect its availability in all such languages, hence in Korean as well as in Japanese. This characterisation of multiple long-distance dependency involves no distinction between the process of construal underpinning long-distance scrambling effects on the one hand, and regular so-called *A'* dependencies, on the other.

What is perhaps most striking is that the essential locality in the construal of the dislocated constituents relative to each other in such constructions is predicted without invoking anything over and above the general processes of tree growth that constitute the core Dynamic Syntax framework. The construal of the two NPs in multiple long-distance dependency relative to each other involves just one initial step of **Adjunction*, and subsequent successive applications of *Local *Adjunction* to the one unfixed node initially constructed; in all but the final instance, there is pointer movement back to the intermediate $?Ty(t)$ -decorated node upon achieving a successful type-assignment for the locally unfixed node, and subsequent enrichment of that tree relation through constructive use of case. This sequence of actions ensures that once the pointer has been moved to some subnode, it cannot return to the top at least until all argument nodes are fully decorated within that substructure. Unlike accounts in other frameworks, no stipulation is required to characterise this composite left-peripheral constituent. It is simply an emergent partial propositional structure of a kind the framework's concept of tree growth naturally reflects.

Moreover, given the analysis, we expect that two or more such NPs can occur in any order, contra Koizumi (2000), with no increase in markedness or any reduction of acceptability. With crossing instances of movement directly excluded as subadjacency violations on those accounts, any account in which multiple long-distance dependency involves a process of multiple movement, together with the assumption of a base ordering of arguments, would predict that any order of arguments other than canonical sequencing in a multiple long-distance construal should lead to a reduction in acceptability judgements – on Koizumi’s account, to a sharp reduction. But as demonstrated in (5)-(6), repeated here, no such asymmetry is detectable:

- (5) shorui-o supai-ni keisatsu-ga jaanarisuto-ga watashita to
 document-ACC spy-DAT police-NOM journalist-NOM handed COMP
 koohyooshita
 reported
 ‘The police reported that the journalist had handed the document to the spy.’

- (6) supai-ni shorui-o keisatsu-ga jaanarisuto-ga watashita to
 spy-DAT document-ACC police-NOM journalist-NOM handed COMP
 koohyooshita
 reported
 ‘The police reported that the journalist had handed the document to the spy.’

On the present account, because all NP sequences preceding a verb yield a partial propositional structure lacking its predicate – with these NPs able to occur in any order because any order of application of *Local *Adjunction* and subsequent enrichment of that underspecified relation will yield the same result – multiple application of *Local *Adjunction* plus enrichment is predicted to be unproblematically available for the sequence of NPs preceding *keisatsu-ga*. So (5)-(6) are well-formed, albeit with a preference for replacing the first *-ga* with *-wa*. However, we also predict, contrary to Takano (2002), that such sequences cannot be split by some matrix-construed adjunct; and again the prediction is correct, as the only interpretation of (24) is the construal as given, with the adjunct *kinoo* (‘yesterday’) interpreted along with the other expressions on either side of it:

- (24) ringo-o kinoo Bill-ni John-ga Mary-ga ageta to kiita
 apple-ACC yesterday Bill-DAT John-NOM Mary-NOM gave COMP heard
 ‘John heard that Mary gave apples to Bill yesterday.’

Strong confirmation of this account comes from cases in both Japanese and Korean involving three levels of embedding, where, setting aside any possible matrix construal of the dative, the two left-peripheral expressions will be forced by the selection of verbs that follow to be construed as contributing separately to the two distinct subordinated structures. (74)-(75) are such cases. On the DS account, any such interpretations are predicted to be totally excluded.⁶¹

- (74) ?*shorui-o supai-ni seiku-wa keisatsu-ga jaanarisuto-ga shobunshita
 document-ACC spy-DAT government-TOP police-NOM journalist-NOM destroyed
 to ukkari barashita to kohyo-shita [Japanese]
 COMP inadvertently revealed COMP announced
 ‘The government publicly announced that the police inadvertently revealed to the spy that the journalist got rid of the document.’

- (75) ?*seryu-lul spai-hanthey cengpwu-nun kyungchal-i kica-ka
 document-ACC spy-DAT government-TOP policeman-NOM reporter-NOM
 epssayssta-ko kapcaki palkhiessta-ko palpyohayssta [Korean]
 destroyed-COMP inadvertently revealed-COMP announced
 ‘The government publicly announced that the police inadvertently revealed to the spy
 that the journalist got rid of the document.’

The only candidate interpretation for (74) is a reading in which the government is taken to have made a public announcement to the spy, a reading which is independently strongly disfavoured. In virtue of the third NP of the sequence being marked by *-wa* as the matrix subject, the use of *ukkari barashita* (‘reluctantly revealed’), and the most embedded verb being *shobunshita* (‘got rid of’), the interpretation might be expected to be one in which the first of the pair of dislocated NPs should be interpretable relative to the most embedded verb, and the dative-marked NP relative to the second level of embedding. But this is impossible, just as predicted by the DS account. Moreover, changing the order of these two NPs does not improve their status. Exactly the same facts and explanation carry over to the Korean (75).

The account also provides a natural basis for the persistence of the Japanese subject restriction within multiple long-distance dependency structures, which as we saw (section 1.1), was problematic for both the Koizumi and Takano accounts ((19),(20), repeated here as (76),(77)):

- (76) san-nin-no kangohu-ga kanjya-o hutari-zutsu Kim-sensei-ga
 three-CLASS-GEN nurse-NOM patient-ACC two-DIST Kim-Dr-NOM
 hitoban-jyuu kanbyooshita to itta
 night-during nursed COMP said
 ‘Three nurses said that Dr Kim looked after two patients at different times all night.’
- (77) kanjya-o hutari-zutsu san-nin-no kangohu-ga Kim-sensei-ga
 patient-ACC two-DIST three-CLASS-GEN nurse-NOM Kim-Dr-NOM
 hitoban-jyuu kanbyooshita to itta
 night-during nursed COMP said
 ‘Three nurses said that Dr Kim looked after two patients separately all night.’

The explanation turns on the fact that the lexical characterisation of Japanese *-ga* is an update mechanism that applies as part of the construction of the emergent structure. Its lexical specification, recall, is that for ANY underspecified tree-node relation of domination by another node $Tn(a)$, i.e. identified as $(\uparrow_*)Tn(a)$, its update will induce the immediate fixing of a logical subject relation. This update will ensure that the *ga*-marked NP cannot be construed as part of a multiple sequence of NPs to be taken as contributing to some subordinate structure. In (76), in which the *ga*-marked expression occurs first, should the rule of **Adjunction* be taken to feed into a step of *Local *Adjunction*, then that initial *ga*-marked expression will enrich the structurally unspecified relation to that of matrix subject without further ado, because of the general applicability of this triggering condition. And once this node is established within the tree at the matrix level, the availability of **Adjunction* at that level will be precluded, because this is applicable only in the absence of any other dominated node within that emergent structure. The following object- and subject-marked expressions will therefore have to be interpreted via application of *Generalised Adjunction* as within a subordinate structure, by the normally available mechanisms for building up structure whose fixed level of subordination within the tree is established only later by the final sequence of verbs.

With the object expression in initial position as in (77), the application of **Adjunction* feeding in to *Local *Adjunction* is certainly available as input to using the tree decorations

provided by *kanjya-o*, as with multiple long-distance dependency effects. However, should the *ga*-marked expression occurring immediately thereafter be taken to decorate a node introduced by *Local *Adjunction*, exactly the same form of update enrichment will take place, since its position within the overall tree matches the triggering condition for the structural enrichment which it induces as an encoded action. However, in this case, this would force subject AND object to be locally dominated by the higher *?Ty(t)*-decorated node, since, by assumption, the nodes for both object and subject expression were constructed from the same intervening type-*t*-requiring node, which, by the enrichment imposed by the *ga*-marking, collapses with the top node (having been left unspecified by the earlier *o*-marking). But any such derivation will invariably fail, as it will yield inconsistency with the matrix verb *itta* that follows. There is, happily, an alternative derivation for (77), involving **Adjunction*, in which the object expression is treated as not immediately fixed locally, with case serving merely as a filter on output for subsequent update. The following *kangohu-ga* then is interpreted as matrix subject, following the stricter tree relation which *ga*-marking induces. Thus the characterisation of *ga*-marking as forcing an immediate-dominance relation upon a constructed unfixed node of any sort, together with the feeding relation between **Adjunction* and *Local *Adjunction*, leads to the desired result. In Korean, with no such rigid imposition of immediate structural enrichment, the subject-marked expression can play a role in multiple long-distance dependency structures like any other case specification, its constraint on update being met at a later stage in the derivation when the partial tree induced by the successive applications of *Local *Adjunction* unifies with some subsequently introduced type-*t*-requiring node.

4.1 Quantifier dependencies and multiple long-distance scrambling

Finally, we come to the challenge of explaining how it is that multiple long-distance scrambling effects could parallel those of short scrambling, whereas regular long-distance scrambling does not. Here DS provides a natural basis for explaining the difference, for it is only in the case of multiple long-distance scrambling that the unfixed node requires a type *t* node. This introduced proposition-requiring node then provides a platform for the construction of nodes on which to build the construal of sequences of NPs. So it will provide a basis from which scope-dependency choices can be made for the terms decorating the two introduced argument nodes, and the succession of actions involved can be identical to that in monoclausal sequences, even though the relevant node itself remains as yet unfixed in the overall structure. The account therefore leads to the prediction that whatever restrictions or flexibility there might be for construing sequences of NPs in local scrambling environments should be replicated in multiple long-distance scrambling environments. This is exactly the pattern we observed in section 1.1 with such pairs of examples as (47) and (50), both of them preferring an interpretation in which the indefinite is construed independently of the quantified expression that follows:

- (47) shorui-o san-nin-no supai-ni jaanarisuto-wa watashita
document-ACC three-CLASS-GEN spy-DAT journalist-TOP handed
‘The journalist handed one document to three spies.’
- (50) shorui-o san-nin-no supai-ni keisatsu-wa jaanarisuto-ga watashita
document-ACC three-CLASS-GEN spy-DAT police-TOP journalist-NOM handed
to koohyooshita
COMP reported
‘The police said that the journalist had handed just one document to the three spies.’

Exactly the same parallelism, we recall, was displayed in Korean. Furthermore, this parallelism between local scrambling environments and multiple long-distance dependency environments

is predicted to extend across ALL cases, with the systematic exception of subject marking in Japanese.

This prediction of such strict parallelism between multiple long-distance dependency and local scrambling, modulo the idiosyncrasies of Japanese *ga*-marking, represents a clear advance of the DS approach over the Koizumi and Takano approaches, for on neither of these does the account of multiple long-distance scrambling bear any relation to the account of short-distance scrambling. To the contrary, Koizumi (2000) invokes vacuous verb-movement, and Takano (2002) invokes *Oblique Movement*, which is distinct from both *A*- and *A'*-*Movement* in yielding a position for the moved node which signally fails to c-command the containing structure out of which it has moved (see Takano 2002). So on either of these accounts, this consistent parallelism is unexpected. Furthermore, the apparent paradox that multiple long-distance scrambling effects can display parallelism with short-scrambling effects with respect to sensitivity to linear order, even though simple long-distance dependency effects do not display any such sensitivity, is also resolved. It is precisely in the presence of a pair of locally constructed argument nodes that such dependency can be established, and it is this constructive process that takes place in both short- and multiple-long-distance scrambling. And even the difference between Japanese and Korean subject marking and their effects is unproblematic to formulate: the subject-fixing actions encoded in Japanese *-ga* are nothing more than the encoding of what had been a routinisation of common practice.

In sum, the system predicts a range of scope-dependency effects, but within limits. There is no overt or covert movement, no total suspension of incrementality. To the contrary, all interpretation involves building up interpretation via sequential steps of parsing; so, in general, interpretation is predicted to follow linear order, with two systematic exceptions. First, indefinites allow a systematic local delay in their final construal in virtue of the anaphoric nature of the basis for establishing their scope dependency, as in (29) (see the discussion in section 2.2):

- (29) kangohu-ga subete-no kanjya-o monshinshita
 nurse-NOM every-GEN patient-ACC interviewed
 ‘A nurse interviewed every patient.’

It is this which provides the underpinning to wide-scope effects for some quantified expression that follows the indefinite, as part of the projection of a single local propositional structure. Secondly, for any expression providing a term of type *e* to an unfixed node as in long-distance scrambling effects, there are structural reasons why interpretation may be delayed, as in (40):

- (40) dono hon-ni-mo sono hon-no tyosya-ga Hiroto-ga syomeishita
 every book-DAT-also that book-GEN author-NOM Hiroto-NOM autographed
 to itta
 COMP said
 ‘That book_{*i*}’s author said that Hiroto autographed every book_{*j*}.’

In all such cases, interpretation will be definitively established only when the structural position of the unfixed node relative to its dominating propositional node is established (see section 3.1). Hence in long-distance scrambling, where quantified expressions may be at an arbitrary remove from their site of construal, inversion of quantifier-anaphora dependencies is expected. The mixed inversion effects of multiple long-distance scrambling arise because these in part display properties of long-distance scrambling, and in part properties of local scrambling. And the minor variation between Japanese and Korean subject-marking follows exactly as we would expect, given the idiosyncratic constructive-case construal induced by Japanese subject-marking. Unlike

all other accounts of long-distance dependency, the facts of multiple long-distance dependency follow in toto from the major architectural properties of the model, specifically from the dynamics of incremental tree growth in real time.⁶²

5. CODA

Throughout this paper, we have sustained a methodology of setting up a formal mechanism which reflects the ongoing dynamics of language processing as closely as possible, broadly following the general Hawkins research methodology (Hawkins 1994, 2004). Despite the coverage achieved, some might be reluctant to grant the strength of the analysis, deeming that the assumptions made violate traditional linguistic methodology by conflating competence and performance considerations illicitly. However, despite the consideration given to performance in the articulation of the grammar's architecture, the distinctiveness of grammar and processor remains intact: the competence mechanism provides a set of constraints within which a parser/producer makes choices relative to context (Cann et al. 2007). Moreover, the arguments of this paper have not involved any loosening of the standard methodological principle that grammar formalisms should be evaluated by their success in capturing structural generalisations. To the contrary, we have argued for our account of Japanese strictly on the grounds that a range of otherwise heterogeneous and puzzling data can be seen to follow from the interaction between general processes of tree update and language-internal idiosyncrasies. A first preliminary result was an explanation of variable scope effects in Japanese and Korean by analysing indefinite NPs as involving an anaphoric aspect to their construal, hence pragmatically constrained – an account in itself of broad cross-linguistic applicability. A second result, the core of the paper, was the multiple long-distance dependency phenomenon: in our account, this has emerged as a consequence of the feeding relation between two construction processes inducing underspecified relations, and the way in which this interacts with the ongoing build-up of partial structure specific to verb-final languages. Each of these problems constitutes a puzzle for movement accounts of scrambling, which do not offer a principled explanation for the interaction of variable scope effects with multiple long-distance scrambling, or any basis for the observed minor cross-linguistic variation between Japanese and Korean. There was then the bonus of the reanalysis of the Proper Binding Condition as epiphenomenal, a mere side effect of the principles of tree growth as implemented along the left-to-right dimension characteristic of language processing. Finally, there was the confirmation provided by the predicted parallelism between multiple long-distance and short-distance scrambling effects, a phenomenon completely unexpected under regular movement accounts. For this overall account of scrambling, all that had to be assumed was an analysis of discontinuity effects in terms of a family of processes of structural underspecification plus update put together with an incremental perspective on scope dependencies. The rest followed.

Respecting the syntax methodology, we have had nothing to say throughout the paper about how selection between different interpretations is made, though the framework provides a clear basis for anticipating where such context-dependent variability will arise. Hence we have not provided any formal basis for the naturalness of one interpretation over another, or naturalness of ordering of one sequence over another. We take this to be strictly within the realm of pragmatics, grounded in relevance and cognitive-cost considerations, hence a matter of performance. Thus this framework is an instantiation of the general Hawkins program of research: principles of grammar are taken to reflect performance considerations, but are not reducible to them as mere epiphenomena not warranting articulation within the grammar. That is, it should not be concluded from these results that the phenomena of scrambling lie outside the remit of grammar. To the contrary, the concepts of progressive tree growth have been shown to underpin long-distance and local dependencies, their interaction with quantifier construal, and the puzzling structural constraints on multiple long-distance dependency, all

incontestably core syntactic phenomena. Rather, it is the concept of syntax, hence of grammar, which has to be shifted. And the advantage of this change of perspective is that it opens up clear avenues to future research in which the grammar system can be made directly accountable to the data of language use, despite its distinctness from a theory of performance. Accordingly, we echo the proposal of Hawkins (1994, 2004), and Phillips (1996) (following Kempson et al. 2001, Cann et al. 2005) that an additional criterion for grammar evaluation should be the closeness of correspondence the grammar formalism displays between the internal constructs of the grammar and patterns directly observable in language use.

REFERENCES

- Abe, Jun. 2006. Identification of null arguments in Japanese. Ms., Tohoku Gakuin University.
- Aoshima, Sachiko, Colin Phillips & Amy Weinberg. 2004. Processing filler-gap dependencies in a head-filler language. *Journal of Memory and Language* 51, 23–54.
- Asher, Nicholas & Alex Lascarides. 2002. *Logics of Conversation*. Oxford: Blackwell.
- Baldrige, Jason. 2002. *Lexically specified derivational control in Combinatory Categorical Grammar*. Ph.D. dissertation, University of Edinburgh.
- Blackburn, Patrick & Wilfried Meyer-Viol. 1994. Linguistics, logic and finite trees. *Bulletin of Interest Group of Pure and Applied Logics* 2, 2–39.
- Bouzouita, Miriam. 2008a. 'At the syntax-pragmatics interface: clitics in the history of Spanish'. In Cooper & Kempson (eds.), 223–265.
- Bouzouita, Miriam. 2008b. *Diachronic development of Spanish object clitics*. Ph.D. dissertation, King's College London.
- Bošković, Zelko. 2002. On multiple *wh*-fronting. *Linguistic Inquiry* 34, 351–83.
- Bošković, Zelko & Daiko Takahashi. 1998. Scrambling and last resort. *Linguistic Inquiry* 29, 347–66.
- Cann, Ronnie & Ruth Kempson. 2008. Production pressures, language change, and the emergence of clitic pronouns. In Cooper & Kempson (eds.), 179–230.
- Cann, Ronnie, Ruth Kempson & Eleni Gregoromichelaki. 2009. *Semantics: the Study of Meaning in Natural Language*. Cambridge: Cambridge University Press.
- Cann, Ronnie, Ruth Kempson & Lutz Marten. 2005. *The Dynamics of Language*. Oxford: Elsevier.
- Cann, Ronnie, Ruth Kempson & Matthew Purver. 2007. Context and well-formedness: the dynamics of ellipsis. *Research on Language and Computation*, 5, 333–358.
- Cappelen, Hermann & Ernest Lepore. 2005. *Insensitive Semantics*. Oxford: Blackwell.
- Carston, Robyn. 2002. *Thoughts and Utterances: the Pragmatics of Explicit Communication*. Oxford: Blackwell.
- Choe, Jaewoong. 1987. *Anti-quantifiers and a theory of distributivity*. Ph.D. dissertation, University of Massachusetts, Amherst.
- Chomsky, Noam. 1995. *The Minimalist Program*. Cambridge MA: MIT Press.
- Cooper, Robin. 1980. *Quantification and Syntactic Theory*. Dordrecht: Reidel.
- Cooper, Robin & Ruth Kempson (eds.). 2008. *Language in Flux: Dialogue dynamics in language variation, change and evolution*. London: College Publications.
- Cormack, Annabel & Ruth Kempson. 1981. Ambiguity and quantification. *Linguistics and Philosophy* 4, 259–309.
- Ferreira, Victor & Yoshita Hiroko. 2003. Given-new ordering effects on the production of scrambled sentences in Japanese. *Journal of Psycholinguistic Research* 32, 573–96.
- Fong, Sandiway. 2005. Computation with probes and goals. In Anna-Maria Di Sciullo & Rodolpho Delmonte (eds.), *UG and External Systems*, 247–68. Amsterdam: Benjamins.
- Gibson, Edward. 1998. Linguistic complexity: Locality of syntactic dependencies. *Cognition* 68, 1–76.
- Gregoromichelaki, Eleni. 2006. *Conditionals in Dynamic Syntax*. Ph.D. dissertation, King's College London.
- Grewendorf, Gunther. 2003. Improper remnant movement. *Gengo Kenkyo: Journal of the Linguistic Society of Japan* 123, 47–94.
- Grice, H. Paul. 1989. *Studies in the Way of Words*. Harvard: Harvard University Press.
- Hawkins, John. 1994. *A Performance Theory of Order and Constituency*. Cambridge: Cambridge University Press.
- Hawkins, John. 2004. *Efficiency and Complexity in Grammars*. Oxford: Oxford University Press.
- Hayashishita, J. 2004. *Syntactic and non-syntactic scope*. Ph.D. dissertation, University of Southern California.
- Hoji, Hajime. 1985. *Logical Form constraints and configurational structures in Japanese*, Ph.D. dissertation, University of Washington.
- Hiraiwa, Ken. 2005. *Dimensions of symmetries in syntax: agreement and clausal architecture*. Ph.D. dissertation, MIT.
- Hoji, Hajime 1985. *Logical Form constraints and configurational structures in Japanese*. Ph.D. dissertation, University of Washington.
- Hoshi, Hiroto (ed.). 2009. *The Dynamics and Mechanism of Language: Perspectives from Linguistics and Cognitive Neuroscience*. Tokyo: Kuroshio.
- Inoue, Atsui & Janet Dean Fodor. 1995. Information-paced parsing of Japanese. In Reiko Mazuka & Noriko Nagai (eds.), *Japanese Sentence Processing*, 9–64. Hillsdale NJ: Lawrence Erlbaum.
- Jun, Sun-Ah 2000. K-ToBI (Korean ToBI) labelling convention Version 3 *Speech Sciences* 7, 143–169.

- Kamide, Yuki & Geoffrey Mitchell. 1999. Incremental pre-head attachment in Japanese parsing. *Language and Cognitive Processes* 14, 631–662.
- Kaplan, Ron & Annie Zaenen. 1989. ‘Long-distance dependencies, constituent structure, and functional uncertainty. In Mark Baltin & Anthony Kroch (eds.), *Alternative Conceptions of Phrase Structure*, 17–42. Chicago: Chicago University Press.
- Karimi, Simil (ed.). 2003. *Word Order and Scrambling*. Oxford: Blackwell.
- Kempson, Ruth & Ronnie Cann. 2007. Dynamic Syntax, dialogue and syntactic change. In Salmon, J & S. Dubenion-Smith (eds.), *Historical Linguistics 2005*, 15–50. Amsterdam: John Benjamins.
- Kempson, Ruth & Stergios Chatzikyriakidis. 2009. The Person Case Constraint as a tree-growth property. Ms., King’s College London.
- Kempson, Ruth, Eleni Gregoromichelaki & Yo Sato. 2009. Incrementality, speaker-hearer switching and the disambiguation challenge. *Proceedings of SRSL 2009, the 2nd Workshop on Semantic Representation of Spoken Language*, 74–81. Athens: Association for Computational Linguistics. <http://www.aclweb.org/anthology/W09-0510>.
- Kempson, Ruth, & Jieun Kiaer. 2009. Japanese scrambling: the dynamics of on-line processing. In Hoshi, Hiroto (ed.), 5–45. Tokyo: Kuroshio.
- Kempson, Ruth, Jieun Kiaer & Ronnie Cann. 2008. Topic and focus at the Peripheries: the dynamics of tree growth. In Benjamin Shaer, Philippa Cook, Werner Frey & Claudia Maienborn (eds.), *Dislocated Elements in Discourse: syntactic semantic and discourse perspectives*, 141–170. New York: Routledge.
- Kempson, Ruth & Akiko Kurosawa. 2009. At the syntax-pragmatics interface: Japanese relative-clause construal. In Hoshi, (ed.), 47–84.
- Kempson, Ruth, & Wilfried Meyer-Viol. 2004. Indefinites and scope. In Anne Bezuidenhout & Marga Reimer *Descriptions and Beyond*, 558–84. Oxford: Oxford University Press. Oxford: Oxford University Press.
- Kempson, Ruth, Wilfried Meyer-Viol & Dov Gabbay. 2001. *Dynamic Syntax: The Flow of Language Understanding*. Oxford: Blackwell.
- Kiaer, Jieun. 2005. Incremental parsing in Korean: at the syntax-phonology interface. *International Symposium on Korean Linguistics* 11. Harvard University.
- Kiaer, Jieun. & Ruth Kempson. 2006a. Pro-active parsing of Korean scrambling. *Proceedings of the West Coast Conference in Formal Linguistics* 24, 209–17.
- Kiaer, Jieun. & Ruth Kempson. 2006b. Pro-active parsing in Korean: at the syntax-phonology interface. *European Conference on Korean Linguistics* 1, 58–72.
- Kiaer, Jieun. 2007. *Processing and interfaces in syntactic theory: the case of Korean*, Ph.D. dissertation, King’s College London.
- Ko, Heejong. 2005. *Syntactic edges and linearization*, Ph.D. dissertation, MIT.
- Ko, Heejong. 2007. Asymmetries in scrambling and cyclic linearization. *Linguistic Inquiry* 35, 315–37.
- Koizumi, Masatoshi. 2000. String vacuous overt verb raising. *Journal of East Asian Linguistics* 9, 227–85.
- Kuno, Susumo. 1973. *The Structure of the Japanese Language*. Cambridge MA: MIT Press.
- Kuroda, Sige-Yuki. 1971. Remarks on the notion of subject with reference to words like *also, even or only* (pt 2). Reprinted in Kuroda, S-Y 1992. *Japanese Syntax and Semantics, Collected Papers*. Dordrecht: Kluwer.
- Kurosawa, Akiko. 2003. *A Dynamic Syntax account of Japanese relative clauses*. Ph.D. dissertation, King’s College London.
- Mahajan, Anoop. 1997. Rightward scrambling. In Dorothee Beerman, David Leblanc & Henk van Riemsdijk (eds.), *Rightward Movement*, 186–214. Amsterdam: John Benjamins.
- Marcus, Mitchell. 1980. *A Theory of Syntactic Recognition for Natural Language*. Cambridge MA: MIT Press.
- May, Robert. 1985. *Logical Form*. Cambridge MA: MIT Press.
- Meyer-Viol, Wilfried. 1995. *Instantial logic*. Ph.D. dissertation, University of Utrecht.
- Miyagawa, Shigeru. 1997. Against optional scrambling. *Linguistic Inquiry* 28, 1-25.
- Miyagawa, Shigeru. 2003. A-movement scrambling and options without optionality. In Karimi, Simil. (ed.), 177–200.
- Miyagawa, Shigeru. 2005. EPP and semantically vacuous scrambling. In Sabel, Joachim & Mamoru Saito (eds.), *The Free Word Order Phenomenon: Its Syntactic Sources and Diversity*, 181–220. Berlin: de Gruyter.
- Miyagawa, Shigeru. 2006. On the ‘undoing’ property of scrambling: a reply to Bošković. *Linguistics Inquiry* 37, 607–624.
- Miyamoto, Edson. 2002. Case markers as clause boundary inducers in Japanese. *Journal of Psycholinguistic Research* 31, 307–47.
- Müller, Gereon. 1996. A constraint on remnant movement. *Natural Language and Linguistic Theory* 14, 355–407.
- Muromatsu, Keiko. 2003. Classifiers and the count-mass distinction. In Audrey Li & Andrew Simpson (eds.), *Functional Structure, Form and Interpretation*. London: Routledge.
- Nordlinger, Rachel. 1998. *Constructive Case*. Stanford: CSLI Press.
- Partee, Barbara & Mats Rooth. 1983. Generalized conjunction and type ambiguity. In Rainer Bauerle, Urs Egli & Arnim von Stechow (eds.), *Meaning, Use and Interpretation of Language*, 361–383. Berlin: de Gruyter.
- Phillips, Colin. 1996. *Order and Structure*. Ph.D. dissertation, MIT.
- Phillips, Colin. 2003. Linear order and constituency. *Linguistic Inquiry* 34, 37–90.
- Purver, Matz, Ruth Kempson & Ronnie Cann. 2006. Grammars as parsers: meeting the dialogue challenge. *Research on Language and Computation* 4, 289–326.
- Rogers, James. 1994. *Studies in the logic of trees with applications to grammar formalisms*. Ph.D. dissertation, University of Delaware.
- Saito, Mamoru. 1985. *Some asymmetries in Japanese and their theoretical implications*. Ph.D. dissertation, MIT.
- Saito, Mamoru. 1992. Long distance scrambling in Japanese *Journal of East Asian Linguistics* 1, 69–118.
- Saito, Mamoru. 2003. A derivational approach to interpretation of scrambling chains. *Lingua* 2003, 481–518.

- Saito, Mamoru. 2005. Further notes on the interpretation of scrambling chains.
- Sauerland, Uri & Elbourne, Paul. 2002. Total reconstruction, PF movement and derivational order. *Linguistic Inquiry* 33, 283–320.
- Sells, Peter. 1999. Postposing in Japanese. Ms., University of Stanford.
- Shirai, Ken-ichiro. 2004. Context, thought and utterance: where context meets syntax (un)expectedly. Ms., University of Nagoya.
- Sperber, Daniel & Deirdre Wilson. 1986. *Relevance: Communication and Cognition*. Oxford: Blackwell.
- Steedman, Mark & Jason Baldrige. 2003. Combinatory categorial grammar. Tutorial paper. Ms., Edinburgh University.
- Szabolcsi Anna. 1997. Strategies for scope taking. In Anna Szabolcsi (ed.), *Ways of Scope Taking*, 109–154. Dordrecht: Kluwer.
- Tada, Hiroaki. 1993. *A/A-bar partition in derivation*. Ph.D. dissertation, MIT.
- Takahashi, Daiko. 2008. Quantificational null objects and argument ellipsis. *Linguistic Inquiry* 39, 307–26.
- Takano, Yuji. 2002. Surprising constituents. *Journal of East Asian Linguistics* 11, 243–301.
- Ueyama, Ayumi. 1998. *Two types of dependency*. Ph.D. dissertation, University of Southern California.

*Author's address: Department of Philosophy,
King's College London,
The Strand, London WC2R 2LS, U.K.
E-mail: ruth.kempson@kcl.ac.uk*

*Author's address: Oriental Institute,
University of Oxford,
Pusey Lane,
Oxford, OX1 2LE, U.K.
E-mail: jieun.kiaer@orinst.ox.ac.uk*

FOOTNOTES

- 1 This paper has evolved over a number of years. We thank Ronnie Cann, Eleni Gregoromichelaki, Stergios Chatzikyriakidis, and Miriam Bouzouita for regular and often detailed support in developing ideas, Wilfried Meyer-Viol for high standards of formal rigour, Hiroto Hoshi for sharpening our understanding of current scrambling issues and the relevance of our own emergent account to these, and many others for comments and ongoing discussion during the preparation of the revised version of this paper. There are many more whose comments have helped to tighten the account; yet none can be blamed for the final result. For help with judgements, discussion and transcription of the Japanese data, we thank Akiko Kurosawa, Yoshiki Mori, Hiroaki Nakamura, Shinichiro Okajima, Masayuki Otsuka, Yo Sato, Tohru Seraku, Ken-ichiro Shirai, Hiroyuki Uchida, Aiko Yamanaka, and Kei Yoshimoto.
- 2 Like other languages with widespread use of bare nouns for both definite and indefinite interpretations, a bare noun at the left periphery characteristically indicates dependence on context for interpretation, hence a definiteness effect.
- 3 Noun phrases may follow the main verb colloquially, but there is reason to treat all such cases as ellipsis (Sells 1999), and we ignore them here. Throughout, we shall follow a common convention among Japanese linguists and avoid use of *wa* in the examples. (4)-(5), in particular, are notably more acceptable if the matrix subject *keisatsu-ga* is replaced by the topic-marked *keisatsu-wa*, as are their analogues in Korean, a phenomenon which we believe to be not insignificant; but in this paper, we follow common practice.
- 4 Implementation of such pragmatic constraints can over time become routinised, giving rise to default strategies that may subsequently lead to grammar-internal change, both semantic and syntactic (for exploration within the Dynamic Syntax framework, see Kempson & Cann 2007, Bouzouita 2008a,b, Cann and Kempson 2008).
- 5 With scrambling having received a great deal of attention over the years, the literature now includes a large amount of data, and there is an impressive number of alternative attempts to characterise scrambling relative to minimalist assumptions. See Karimi (ed.) (2003) for a representative set of views.
- 6 The LF lowering of Bošković & Takahashi has been largely set aside in recent minimalist accounts of Japanese (Miyagawa 2006); and with LF Lowering and Radical Reconstruction being argued by Miyagawa to be non-distinct, Radical Reconstruction becomes equally problematic.
- 7 Saito (2005) appears to concur with this methodology in so far as he sets aside the non-canonical construal of existentially quantified subjects relative to quantified NPs within the following VP.
- 8 This result, which in this paper is only a sub-part of the overall explanation, is independently reported in Cann et al. (2005, chapter 6). See also Kempson & kiaer (2009).
- 9 The account to be provided will make no use of permutation processes of words of any sort, and we retain the term *scrambling* for informal purposes only.
- 10 For reasons of space, we do not give all available interpretations of the data provided, but only those interpretations (or their absence) which are pertinent to the argument at hand. (5)-(6), for example, also allow an interpretation in which the dative is taken as modifying the matrix verb, though in (6) this is dispreferred.
- 11 The three papers cited here illustrate minimalist approaches to scrambling. There is a large and ever-growing body of literature on scrambling in a number of languages (see Ko 2005, 2007 for work on Korean scrambling). However, the number of papers addressing the problem of multiple long-distance dependency is considerably smaller.
- 12 Some Japanese speakers report that this is in principle possible as a highly marked interpretation, given the cultural implausibility of the other interpretation, but that nevertheless the implausible interpretation is by far the more salient.
- 13 One speaker, though commenting that neither sentence was fully acceptable, hesitantly said that (19)-(20) could possibly have as a highly marked interpretation one in which *Kim-sensei-ga* is construed as the matrix subject, particularly if a predicate such as *nakereba ikenai* ('must') is added to discourage the construal of *kangohu-ga* ('nurse') as subject. None of our other informants accepted this interpretation at all, other than as a production error that would need clarification.
- 14 As these data show, the distributivity markers in the two languages do not have quite identical properties. In Korean the number expressions are determiner-like, immediately preceding the noun without any suffixation, and the distributive marker occurs as a suffix on the noun. In Japanese, number expressions are predicative, occurring in prenominal position suffixed with the nominaliser *-no* which, amongst other uses, is also associated with head-internal relatives; for the NP to be qualified by a distributivity marker ensuring narrow-scope construal of the NP, it is the post-nominal number which is suffixed with the distributive marker, as a form of apposition (a so-called floating quantifier). (Whether these various uses of *-no* can be reduced to a unitary analysis is not something we address here.) These minor differences give rise to somewhat distinct construals of quantifying expressions in Japanese and Korean, but these differences have no bearing on the different levels of embedding relative to which the sequenced subject-marked expressions are understood in the two languages.
- 15 One reviewer has drawn our attention to the work of Ko (2005, 2007) on scrambling in Korean, whose major focus is on quantifier float phenomena which we do not address in this paper. The Ko account of scrambling

is in terms of preserving vP ordering phase-internally, an account which predicts required adjacency of the subject and its floated quantifier, with no such adjacency being imposed on object quantifier float; he does not address multiple long-distance dependency. With no potential for re-ordering subjects and objects independent of phase-internal operations, the Ko account would seem to wrongly preclude the freedom of subject-object ordering in multiple long-distance dependency pairings seen in Korean, as in (17)-(18), leaving unexplained this core property of Korean multiple long-distance dependency and the asymmetry between Korean and Japanese scrambling.

- 16 In its original formulation (Saito 1992), the Proper Binding Condition was an S-structure condition definable as a stipulation but nevertheless straightforwardly characterisable: with the abandonment of S-structure, this constraint became much less natural to state, and every reformulation in the face of counterexamples is little more than a statement of the description of the problem as set out above. On example (21) see section 2.5 below. On *remnant movement* see also Müller 1996.
- 17 NM indicates the nominaliser function of *-no*, one of the core uses of this particle.
- 18 Things are little better in other frameworks. Within Lexical Functional Grammar (LFG), the concept of inside-out functional uncertainty should provide a mechanism for describing the facts (as in the constructive use of case in Warlpiri: Nordlinger 1998); but, in order to achieve such an effect, this has to be lexically triggered. With multiple long-distance scrambling, however, there is no such lexical trigger, and hence no means of securing the relative locality of the two argument expressions. Categorical formalisms might seem the most promising way to address these data given the nonstandard assumptions made about constituency, but multiple long-distance scrambling as in (5) is problematic there too. The pair of NPs at the left periphery can certainly themselves be identified as a constituent using Combinatory Categorical Grammar (CCG) tools (either by type-raising or by multi-set typing: Baldrige 2002). However, the presence of the immediately following subject prevents this created constituent from combining with some appropriately typed verb. As a result, the only way to yield a well-formed derivation for (5) is for the two VERBS to combine together. But if so, the result will be a multi-set composed of four or more arguments, with only stipulation distinguishing which arguments go with which verbs (Steedman & Baldrige 2003). And, in this latter case, the additional stipulation affecting subject-marked expressions goes completely unexplained. The generality of the processes of type-raising and multi-set typing, just as the minimalist adjunct analysis, loses the distinctive basis of subject-marking over which to define such a restriction. The categorial account of Steedman & Baldrige faces particular semantic problems, as it is unclear what corresponding semantic lambda-term could distribute this n-tuple across appropriate argument slots in a single step of application, given that functional application is defined to apply to just one argument (see Kiaer 2007 for discussion). With only stipulation distinguishing which argument goes with which slot, there is also no basis for predicting that the *ga*-marking restriction would carry over to these compounded argument sequences.
- 19 As one reviewer reminds us, (26) could be analysed as unambiguous with only the narrow scope reading for the indefinite, because the reading in which the indefinite takes the universal within its scope entails that weaker reading (as for example suggested by Kempson & Cormack 1981). However this leaves both the nonambiguity of (27)-(28) and the perceived ambiguity of (25) unexplained. The reviewer also suggested that data involving bare nominals should not be used in debates about quantification, as their homonymous nature can lead to misclassification of the data. However, contrary to the commonly assumed analysis of numerals as number-ambiguous in Japanese (Muromatsu 2003), we take such data to be indicative of the underspecification of Japanese nouns vis-a-vis assignable interpretations, and not as a phenomenon of lexically distinguished homonymy. As a historical note, early analyses attempting to downplay in status distinguishable but entailment-related interpretations (so that one is set aside as merely an instantiation of the other) predated the huge body of work that has since transformed our understanding of the systemic context-dependency of natural-language construal (Kamp 1984, Sperber & Wilson 1986 and many others following them).
- 20 The judgements provided by Saito 2003, 2005 for (40) is ‘?’ for an interpretation construing the demonstrative NP as dependent on the quantifying expression; but whether or not this is a categorial judgement, the judgement of sharp asymmetry between the availability of a quantifier-bound interpretation of the demonstrative for (39) and for (40) is robust and widely agreed on. In this connection, there are data from Ueyama (1998) largely involving *wh*-expressions, on the basis of which she argues for apparent invariant licence of quantifier binding as long as the binder precedes the dependent term; but we believe there is reason not to expect parallelism between *wh*-expressions and other quantifiers (see Kempson et al. 2001, chapter 7, for arguments), and in any case the critical examples for the Ueyama account involve D-linked *wh*-questions, which have familiar, if poorly understood, name-like properties. The effect of the particle *-mo* in (39)-(40), translated literally as ‘also’, cannot always be preserved in translation: in these examples, where it is suffixed to *hono*, its presence is a reflection of the distributive interpretation imposed by the quantifier *dono*.
- 21 In this paper, we restrict our primary attention to quantified expressions other than *wh*-expressions. See Kempson et al. (2001, chapter 5) for arguments that *wh*-expressions are not regular quantified expressions in any language, but place-holding devices of a specialised sort, with clause-typing properties associated with clause-initial position.
- 22 While the grammar formalism does not itself constitute a parsing device, both parsing and production models are presumed to make use of the same tree-growth mechanisms, the primary difference between them being that, in the latter, there is a fixed decorated tree relative to which all selected tree-growth steps have to be checked for commensurability (see Purver et al. 2006, Cann et al. 2007). Given the commitment to monotonicity of individual tree-transition sequences, a model of disambiguation to be effected in such a

parser would have to be one of eliminating alternative possible routes of interpretation that become available at each step, rather than a hypothesis-and-revise system (see Phillips 1996, 2003, Aoshima et al. 2004). Psycholinguistic evidence favours the DS account (as demonstrated for Korean by Kiaer & Kempson 2006a,b, Kiaer 2007; see also Gibson 1998), as the DS mechanisms correspond very directly to the incremental dynamics of how online decisions are made. The Phillips unforced fix-and-revise account of incrementality, to the contrary, fails to apply to long-distance scrambling, there being no fixed structure available until the final verb is parsed.

- 23** Tree logics define trees by describing tree nodes and the relations between them within any one such structure. Nodes within such described structures may be assigned attributes as ‘decorations’: the decorations will vary from application to application. In Dynamic Syntax, in particular, with its emphasis on the process of progressively developing such structures, mechanisms are defined for first constructing and then decorating each node in an emergent tree.
- 24** The *F_o* predicate is generally omitted in the tree displays for simplicity.
- 25** The pointer \diamond indicates the node under development: $Tn(0)$ is the root node. The formula predicate given by the verb is written here as the stem form of the verb. For *yonda*, the stem is *yom-* (with *yon-* as an allomorphic variant). We largely leave tense to one side in this paper (see Shirai 2004 for a DS account of tense in Japanese, and Gregoromichelaki 2006 for an account of conditionals which advocates the positing of an event term as an additional argument).
- 26** Lexical tree updates are ensured by actions in an “{ IF,THEN,ELSE }” format, in which the condition presents a specified trigger for an encapsulated macro of actions for making and decorating nodes of the subtree to be induced. We ignore all such details in this paper (see Cann et al. 2005).
- 27** Particular choice of value for such variables involves general cognitive constraints such as *relevance* (Sperber & Wilson 1986). This commitment to all aspects of predicate-argument structure being identified either contextually or from the construction process differentiates this system from categorial grammars, where with interpretation defined over a morphological string, verbs have to be multiply defined according to the number of morphologically realised arguments, leading to multiple type homonymy (Baldrige 2002). Contrary to the DS style of analysis, NP-ellipsis in Japanese has been argued to be ambiguous between an invisible pronoun and phrasal ellipsis analysis rather than being underspecified, on the strength of the strict-sloppy distinctions available (Abe 2006, Takahashi 2008). But in DS these are accounted for by analysing context as n-tuples of word, structure, and actions: strict interpretations of pronouns and ellipsis pick up on context-provided content as values for the assigned meta-variable, whereas sloppy interpretations pick up on context-provided actions (see Purver et al. 2006; Cann, Kempson, & Purver 2007, Cann, Kempson & Gregoromichelaki 2009).
- 28** This has led either to the invocation of covert movement mapping the syntactic string onto some level of LF representation (May 1985 and many others since), or to the recognition of semantic operations independent of syntax involving type-lifting and an associated quantifier storage mechanism (Cooper 1980, Partee & Rooth 1983 and many others).
- 29** The epsilon calculus is the formal study of the arbitrary names used in predicate logic calculus natural-deduction proofs, in which all quantifiers are replaced by names with side-conditions controlling their use. These side-conditions reflect the various scope dependencies within an individual formula, and in the epsilon calculus such dependencies are reflected in the terms themselves. The epsilon calculus thus provides terms denoting witness sets which natural language expressions can then be seen to denote.
- 30** Floating quantifiers might seem to be evidence against such an account, an issue which we do not consider in this paper. But we would analyse floating quantifiers in terms analogous to apposition structures, as illustrated in English by *A friend of my mother’s, someone very famous, is coming to stay*. These indicate that epsilon terms, once constructed, can be subject to processes of extension, leading to terms with a compound restrictor specification (see Kempson, Gregoromichelaki & Sato 2009).
- 31** Idiosyncratic scopal properties of individual determiners are inexpressible in a generalised quantifier system. In systems and frameworks advocating covert movement, idiosyncratic scopal properties of expressions can only be expressed through homonymy, with one of the expressions being a quantifier expression, the other not (see for example Szabolcsi 1997). See Kempson et al. (2001), Kempson & Meyer-Viol (2004) for arguments to the contrary, demonstrating close parallelism between indefinite construal and pronoun construal, with the former establishing interpretation via dependency on some other term introduced in the interpretation process.
- 32** This linearity effect is even stronger if a demonstrative expression occurs at the left-peripheral position as a subpart of such an existential term. Thus the processing of *sono* prior to processing the quantifying term (which requires selection of a new variable) overwhelmingly favours an indexical interpretation for the demonstrative in (i), hence an independent interpretation for the containing composite existential term – unlike the inverse interpretation, for which the demonstrative would be interpreted as bound by the quantifying term with consequent narrow-scope interpretation for *sono gakusei-no tyuuta-ni*:
- (i) *sono gakusei-no tyuuta-ni dono gakusei-mo syokai-shita*
that student-GEN tutor-DAT every student-also introduced
‘I/somebody introduced every student_{*i*} to that student’s_{*j*} tutor.’
- We are grateful to one of the referees for bringing this example to our attention.

- 33 This flexibility of indefinites, we suggest, also underlies the ambiguity of the double-object mixed quantification sentences discussed in Sauerland & Elbourne (2002). They observe that initial indefinite accusative-marked NPs freely license inverted construal, but initial indefinite dative-marked NPs do not, at least for some speakers. In the cited cases, there are two additional complexities – that dative expressions are systematically ambiguous between being a predicate adjunct and a third argument, and that with human-denoting NPs, there is a widely observed but poorly understood increased tendency to follow linear order, so that a dative-marked initial indefinite that is human-denoting is generally construed as independent of whatever term follows. Given that not all speakers agree with the reported distribution, we have not included these data here.
- 34 A similar type of explanation might apply to the pragmatic constraint observed by Hayashishita (2004). Hayashishita argues that there are freezing effects in scrambling for a sequence of three NPs in inversion cases in Japanese, with the subject having to take narrower scope dependency than any intervening VP-internal quantifying expression, should the object be construed as taking widest scope (the literal translation is that of Hayashishita):
- | | | | | | | |
|-----|----------------------|----------------|---------|-----------|-------------|------------|
| (i) | san-nin-izyoo-no | kyoojyu-ga | rei-no | hutari-no | gakusei-o | hutatsu-no |
| | three-CLASS-more-GEN | professor-NOM | the-GEN | two-GEN | student-ACC | two-GEN |
| | kaisya-ni | suisenshiteita | | | | |
| | company-DAT | recommended | | | | |
- ‘As for two students, three or more professors each recommended them to two companies’
 (the supposedly precluded reading)
 ?*‘As for two students, they were each recommended to two companies by three or more professors’
 (the supposedly required reading)
- On the account suggested here for indefinite expressions in subject position, this is to be expected, demonstrating that if the scope of the subject expression is not established in a way that reflects linear order, then the only natural subsequent point for doing so is once an interpretation for the whole predicate has been established. Unfortunately, however, it is not clear that these data are robust: the intuitions of all our informants consistently failed to match those recorded by Hayashishita, most of them finding the supposedly precluded interpretation the most natural.
- 35 In the case of paired numerical expressions without any such marker, it has been observed that use of numbers strongly buttresses independent construal of the containing NP. In the absence of a DS account of plurals, however, the formulation of such group interpretations, and the construal of paired numerical expressions in the same manner, hence independently of each other, must remain a topic for future research (for an early characterisation, see Kempson & Cormack 1981). It should be noted, however, that the epsilon calculus is well suited to expressing branching quantification, which these indicate (Meyer-Viol 1995).
- 36 One referee notes that verbs imposing intensional construals on their arguments may restrict scope flexibility, a good illustration of lexically imposed idiosyncrasy.
- 37 D-tree grammar formalisms licensing underspecified tree relations have been taken by Marcus 1980 and others following him as the formal basis for parsers that make essential reference to some application-neutral grammar formalism articulating only complete trees.
- 38 Relative clause construal, adjunct clause construal, and coordinate structures are all defined as involving the projection of independent *linked* structures that get compiled into the overall representation after having initially been defined as separate trees (Kempson et al. 2001, Cann et al. 2005).
- 39 All rules are specified here solely in terms of their tree update, for simplicity. Unfixed nodes are distinguished in the diagrams by indicating them with a thickened dashed line for a locally unfixed node requiring update within an individual propositional structure, a regular dashed line for an unfixed node to be updated within a single emergent tree, and a dotted line for radically unfixed relations only requiring update within some global set of trees.
- 40 This display is straightforwardly definable in these terms only using the lexical-action format, as this itemizes any tree update in terms of individual steps of tree-constructing actions, hence requiring the introduction of an unfixed node along a $\langle \uparrow_1^* \rangle$ relation. In Cann et al. (2005), for consistency, we defined this computational action using a novel modal operator. However, since all computational actions are definable in terms of lexical actions of tree update, though not vice versa, we here prefer the display of (59), which brings out more vividly the way in which this rule differs from **Adjunction*. The extension of the use of the lexical-action format to other computational actions remains a matter for future research.
- 41 We illustrate the output of the rule with the requirement $?Ty(e)$. Gregoromichelaki (2006) argues that all tensed propositions are accompanied by an event term. With this modification, **Adjunction* would impose a unique type requirement on the constructed node.
- 42 The fact that the verb’s actions include explicit introduction of tree relations is harmless, as this otiose introduction of argument-node relations will collapse with any nodes already introduced and decorated, the argument decorations provided by the verb being invariably those of a metavariable with attendant requirements on its substitution, by definition compatible with fixed values that may have already been established through parsing of prior explicit NP expressions. The formal underpinnings of this are identical to the constraint of only one unfixed node of a type at a time. Nothing precludes the construction of a certain structural relation more than once; it is merely that two such operations will only yield one node, an outcome which is legitimate just in case the decorations the operations induce are compatible.

- 43 Most commonly, *wa*-marking is taken as indicating matrix subject, but this is not invariant and we take it to be a routinisation effect.
- 44 The structural details of this analysis are confirmed by the obligatory construal of a dative-marked NP adjacent to the topic-marked NP as being within the embedded structure (see Cann et al. 2005, chapter 6 for more detailed discussion). We are grateful to Hiroto Hoshi for bringing these data and their DS significance to the attention of the first author.
- 45 It is this interpretation strategy which we suggest is behind the judgements of any speakers who find that the earlier data (19)-(20) marginally allow a second interpretation with the initial *ga*-marked NP as subordinate, in particular if the second *ga*-marking on *Kim-sensei-ga* in (19) is replaced by *-wa* to try and force its surface subject construal as in (i):
- | | | | | | |
|-----|-----------------|-----------------|-------------|--------------|---------------|
| (i) | ??san-nin-no | kangohu-ga | kanjya-o | hutari-zutsu | Kim-sensei-wa |
| | three-CLASS-GEN | nurse-NOM | patient-ACC | two-DIST | Kim-Dr-NOM |
| | hitoban-jyuu | kanbyooshita to | itta | | |
| | night-during | nursed COMP | said | | |
- ‘Three nurses said that Dr Kim looked after two patients at different times all night.’
 ?= ‘Dr Kim said that three nurses looked after two patients all night.’
- The effect of this strategy applied to (i) would be to imply that the projection of content pertaining to *kanjya-o hutari-zutsu* (‘two patients’) is from Dr Kim’s perspective (the node induced for this expression to decorate being the node from which the *link* transition has to be constructed). The initially placed *san-nin-no kangohu-ga* (‘three nurses’) would, however, be construed as denoting a group independently decided upon, with the late placement of *-wa* to indicate surface subject necessitating a revision of such an incrementally established interpretation. Hence the sharply reduced acceptability reported by all speakers.
- 46 The anaphoric identification of the subject term as *Hiroto*’ in this derivation is in virtue of the presence of the term in the partial representation already constructed and not by some analogue to any *c*-command relation. This sequence of steps, though a natural means of interpretation since locally incremental, is by no means the only possible route to interpreting (65). In a parsing-based formalism, the existence of such alternatives for a single output interpretation is expected: there is no commitment to uniqueness of derivational history for a given pairing of string and logical form.
- 47 These data have been taken up recently by Hiraiwa (2005), who doubts the data themselves, assigning a borderline but not wholly ungrammatical status to (69) in the light of (i), with a passive form of the verb (suggesting an ECM type of structure):
- | | | | | | |
|-----|------------|------|-----------|--------------|--------------------|
| (i) | *bada-da | to | Taroo-ga | minna-ni | omow-arete-iru |
| | stupid-COP | COMP | Taroo-NOM | everyone-DAT | consider-PASS-PRES |
- ?’*Everyone considers Taroo stupid.’
- Our informants gave mixed judgements ranging from ungrammatical to borderline. It is notable that with removal of the matrix passive form, all speakers judge the sequence to be ungrammatical:
- | | | | | | |
|------|------------|------|--------------|-----------|---------------|
| (ii) | *bada-da | to | minna-ga | Taroo-o | omotte-iru |
| | stupid-COP | COMP | everyone-NOM | Taroo-ACC | consider-PRES |
- ‘Everyone considers Taroo is stupid.’
- We do not consider ECM constructions in this paper, but they notoriously blur clausal boundaries. In the light of this, we take the data originally reported by Saito (1992) to be robust. We thank a reviewer for reminding us of these data.
- 48 Surprisingly, Korean is more liberal in allowing postverbal NPs to be interpreted as part of the subordinate clause, as long as intonation signals their inclusion within the preceding sequence as a unit (see Kiaer 2007, where the verbal suffixes of the two languages are argued to be distinct – Korean notably has a declarative marker, which Japanese lacks).
- 49 Another, apparently independent constraint which can be seen as a consequence of the left-right dynamics intrinsic to the framework is the so-called Right Roof Constraint which enforces rightward movement to be clause-local, against the symmetrical expectations of standard head-driven, order-neutral projection of content, which would in principle allow either leftward or rightward movement to be unbounded. The Right Roof Constraint restriction is grounded in the same explanation as the Proper Binding Condition. The emergent tree, once all terminal nodes in some subtree are decorated, is subject to a strict compositionality restriction: the decorations for a mother node cannot be compiled (by functional application applying to the daughters) until both such daughters have full formula specifications. In consequence, though the pointer indicating the node under construction can return to some daughter node once its sister node is completed, the complete decoration of their mother node depends on both daughters having a complete set of decorations (see Cann et al. 2005, Kiaer 2007 for details).
- 50 The data concerning the reflexive pronoun *zibunzisin* are systematically reported by our informants as being less clear than is indicated in the literature (Saito 2003), so we leave all consideration of anaphors to the side. See Cann et al. (2005, chapter 7) for an account of *zibunzisin* that reflects data as reported in Saito (2003).
- 51 Once a node’s type requirements are satisfied, pointer movement back from that node is licensed as long as its relation to its dominating node is not fixed.
- 52 It should be noted that on this analysis, there are no grounds for distinguishing radical reconstruction effects from other long-distance dependency effects. *Wh*-expressions in Japanese and Korean are defined as projecting a requirement that they contribute a term to some Q-marked structure; the main difference in clause-typing from a language such as English is that this specification is provided by some other morphological marking,

and not by the *wh*-expression itself. The primary argument, that *wh*-movement and reconstruction effects cannot be collapsed because of Principle C effects associated with radical reconstruction of complex-NP-containing *wh*-expressions (Bošković and Takahashi 1998), in any case fails to apply in DS derivations since what decorates a tree is not a natural-language name but some rigidly denoting term constructed from it, and the constraint of choosing some fresh variable which would be the analogue of Principle C is imposed at the point of parsing the lexical word and not at the point of subsequent unification.

- 53 As indicated in footnote 20, there is some disagreement over data in this area, in particular in connection with *wh*-expressions.
- 54 $\langle U \rangle$ is the third Kleene operator, whose values range over mother and inverse *link* relations, the very weakest dominated relation indicating that the rootnode is above the current node, possibly across a sequence of trees.
- 55 It might also be enriched to $\langle \uparrow_* \rangle Tn(0)$, allowing a further level of embedding.
- 56 As already noted, this device is much more freely available in Korean (see Kiaer 2007 for test results demonstrating the role of intonation in ensuring incrementality in processing Korean).
- 57 There are differences between the two languages as to which nodes allow multiple case-marking, but we leave this to the side here as not relevant to scrambling. The languages also differ as to the extent to which expressions can follow the complementiser and yet be construed at the subordinate level, with Korean marginally allowing this possibility, a phenomenon we also leave for future research.
- 58 See Kiaer (2007) for arguments that phonological lengthening in Korean encodes indication of a non-canonical, that is non-local, interpretation process.
- 59 It might seem that this constraint is independently unsustainable because of well-established cases of multiple *wh*-movement, e.g. in Slavic languages (Bošković 2002, among others). In these cases it would appear that an alternative sequence of strategies is at work. In these, the leftmost such *wh*-expression is subject to a D-linked construal and allows pronoun doubling, suggesting, in DS terms, that this *wh*-expression at least may be taken to decorate a node in a *linked* structure, hence able to be quasi-independent structurally from the remainder of the string that follows, with the first *wh* expression correlated with the other expressions by an anaphoric process, with the second and subsequent expressions decorating some unfixed or locally unfixed node (the analogue respectively of base-generation *vs.* movement). Since we have not included discussion of relative clauses, which constitute the primary evidence for positing paired linked structures, we have not taken up this alternative here. However, it is notable that on such an account, no such essential relative locality between the *wh*-expressions would be expected. Here, we merely note that candidates for multiple long-distance dependency in Japanese and Korean are not taken to involve some left-peripheral topic-marked expression (morphological topic-marking being diagnostic of such linked structures), whose left-peripheral position, when it occurs, has a quite different status.
- 60 As with single long-distance dependency, we would expect the use of such a strategy to be correlated with an intonational break in the form of an Intonational Phrase boundary after the left-peripheral pair of constituents. Indeed misplacement of such an intonational break can lead to serious garden-pathing: see Kiaer (2007).
- 61 We are grateful to one of the referees for leading us to construct such critical examples.

- 62 For reasons that we do not entirely understand, multiple dative construals in Korean are not licensed. Indeed multiple dative sequences are avoided altogether:

(i)	?*Mina-hanthey	Yuna-hanthey	Jina-ka	Jieun-ka	Pizza-lul	Pizza-Express-ese
	Mina-DAT	Yuna-DAT	Jina-NOM	Jieun-NOM	pizza-ACC	Pizza-Express-at
	sa-cwuessta	ko	haysseyo			
	gave-bought	COMP	said			
	?*‘Jina said to Yuna that Jieun bought Mina a pizza at Pizza Express.’					
	?*‘Jieun said to Yuna that Jina bought Mina a pizza at Pizza Express.’					

This may be due to the intrinsic underspecification of dative, hovering as it does between argument and adjunct, hence not licensing any tree enrichment (despite the common presumption, also adopted here, that the dative projects an argument to a three-place predicate). We leave this issue to the side here.