Treegrowth Dynamics*

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In this paper we address the challenge of clitic clusters in Romance languages and the puzzling gaps in the clitic templates which they display, and show how the distribution of clitics and these apparent gaps are grounded in one and the same structural restriction: a restriction on tree-growth. This parsing-inspired restriction states that in building up structurally underspecified relations, only one such relative weak relation can be constructed at a time. This is a core restriction underpinning concepts of tree growth central to the Dynamic Syntax framework which argues that natural-language syntax is grounded in tree growth mechanisms that reflect on-line processing dynamics. We apply this constraint to explain the restriction on the morphological clitic templates of Romance currently referred to as the Person Case Constraint (PCC). We show that the explanation of such gaps in terms of preclusion of more than one structurally weak relation is grounded in the diachronic calcification of tree-growth strategies that had earlier constituted a freely available set of options for building up interpretation via flexible word orders, individual clitics and clitic clusters severally displaying the various strategies. Apparent counterexamples to the constraint are explained in terms of the availability of an alternative adjunct strategy not involving any such underspecification which, in those languages apparently violating the constraints, had led to homonymy in the clitic system. Finally, the force of the structural basis for the PCC is buttressed by the demonstration of its applicability to explain the object-marking puzzle of Otjiherero, a Bantu language which, despite allowing construal of object agreement markers as both indirect and direct object, never allows both to be co-present.

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1. Preliminaries

In this paper, we address the challenge of explaining clitic clusters in the Romance languages, with the puzzle of apparent Person Case Constraints that are associated with these clusters which, though very widespread, by no means universally hold, with variation between otherwise very closely related languages. Such clitic clusters are often characterised as irreducibly opaque morphological templates, little more than a cleaned-up disjunctive statement of the facts of the matter. We argue that these clusters and the gaps in the paradigms associated with them can be explained in terms of a constraint on procedures for building up representations of content in real time, a constraint which also serves to determine limits on NP-placement in free scrambling languages. Our case study is the clustering properties displayed in the Romance languages, our principal focus being on Latin and Medieval Spanish. What we show is that the various types of clitic behaviour match the range of strategies available for the structure-building mechanisms underpinning construal of sequences of NPs in Latin, with its free scrambling of NPs before the verb; and we argue that the emergence of the clitic systems of Romance was a calcification of these strategies variously associated with individual lexical specifications. We go on from this to demonstrate that the gaps in these paradigms, in particular the so-called Person Case Constraint, can also be explained in terms of the very same constraint that underpins scrambling of NPs. So the explanation both of clitic clusters and their constraints is essentially syntactic, but with a twist, as the structural explanation to be provided makes essential use of the growth of representation of content to be attributed to the string, so essentially semantic.

What we argue is that mechanisms for inducing structural representations of content involve constructing structurally underspecified relations, in particular for structural relations before a verb is processed; and, as we shall show, all natural language systems are defined so as to preclude the building of more than one such weak structural relation at a time. This, we claim, is a core structural restriction underpinning all tree growth mechanisms in natural language, a property of the tree logic in which such mechanisms are grounded. In the case of the clitics, the restriction is largely but not exclusively realised by the structurally syncretic case forms, and we argue that the syncretic morphology accurately depicts the structural lack of specification in the tree-relation constructed. Apparent counterexamples can be explained in terms of the availability of an alternative parsing mechanism that does not involve such a structurally underspecified relation which, through its widespread use in those languages apparently violating the constraint, became encoded as a homonymous clitic form. Independent evidence of the form of explanation is demonstrated by the applicability of the same procedural tree-growth restriction to explain a gap in the paradigm of object marking in Otjiherero, a Bantu language allowing object marking across a range of different complement types such as direct, indirect and locative objects, but only ever allowing one object marker in ditransitive constructions, irrespective of which grammatical relation is expressed through object marking. We will conclude that the broad applicability of the constraint of only one type of underspecified relation at a time within both syntax and morphosyntax is strong evidence of the parsing grounding of structural properties of language, hence that core mechanisms of grammar should reflect processing dynamics.

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1.1 The Person Case Constraint: A sketch

The Person Case Constraint is a label for a puzzling pair of restrictions in morphosyntax. In languages that have pronominal clitic systems, these commonly cluster together either occurring immediately preverbally, or in some not very clearly definable second position. Over and above the strictly syntactic problem of how to characterise this position, these clusters display such heterogeneity in the internal orderings which individual languages and/or dialects license that their variability is said to warrant a separate morphology component within the grammar. Nonetheless, they are subject to restrictions that hold with striking regularity across different language families. Though some gaps are random, others never, or almost never, occur. The most well-known of these has come to be known as the Person Case Constraint, of which there are two variant forms. The most widespread is that construal of either first and second person forms as an accusative can never co-occur with third person dative, a restriction which holds in all the Romance languages as long as we keep distinct the various usages of the dative clitic as ethical, reflexive, and impersonal. Thus, though there are occurrences of first or second person construed as dative followed by third person accusative in Medieval Spanish, just as in other Romance languages, as in (1), there is no reported occurrence of construal of either as accusative, with dative third person (data from Granberg 1988: 176):[1]

(1) agora quiero **uos** **lo** descubrir [Medieval Spanish]
now want.1sg you.dat it.acc reveal.inf
'Now I want to reveal it to you.'

The lack of first or second person accusative forms with a third person dative is a puzzling gap if such clitic forms are thought to be a mere listing of possible morphological forms. There is also a further restriction displayed by a subset of these languages: first and second-person pronominal forms should not co-occur, as in the French example in (2). In this case, the restriction is less definitive, and in Latin (3) and Spanish (4) such examples are wellformed, a problem which we return to:

(2) *Il **me** **t'** a fait montrer un livre [French]
he 1sg 2sg have.3sg made show.inf a book
'He made me show you a book.'

(3) qui **me** **tibi** fecerit hostem [Latin]
who.sg.nom 1sg.acc 2sg.dat make.3sg.perf enemy.sg.acc
'who would make me an enemy to you.' (Lucan *De Bello Civile* 1)

(4) **Te** **me** recomendaron [Spanish]
2sg.acc 1sg.dat recommend.3pl
'They recommended you to me.'

Such gaps, and indeed the less common lack of any such gap in some languages, are mysterious, since they appear to lack syntactic, semantic, or phonological explanation (Anderson 2005, Monachesi 2005). That this is neither a semantic or pragmatic restriction can be shown by the fact that in all these languages the restriction can

[1] We list examples with clitic pronouns in bold for clarity.

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simply be side-stepped by realizing one of these arguments as a strong pronoun or full NP (data from Rivero 1997):

(5) Si **de nos te** non partes … [Medieval Spanish]
if from us you.refl not depart
'If you do not leave us …'

In the face of the various challenges which these clustering facts present, many authors settle for a discrete morphological form of explanation, not characterising the phenomenon within the syntactic domain at all (see e.g. Nevins 2007, Rivero 2007). In this paper, however, we explore a perspective in which these restrictions can be seen as a consequence of a strong structural restriction, one that is a constraint on growth of interpretation. The restriction is a constraint debarring more than one underspecified structural relation at any one point in the unfolding construction process of establishing interpretation. We shall argue that the reason it emerges as a morphosyntactic restriction in the Romance clitic systems is that the patterns which Romance clitics severally display each constitutes a calcification of some processing strategy that was freely operative in the earlier Latin system, subject to general constraints on growth of interpretation, so the debarred clitic cluster sequences currently known collectively as the Person Case Constraint (PCC) (e.g. Adger and Harbour 2007) cannot arise because the earlier pattern of NP sequencing was precluded. The difficulty for any such structural account of this constraint is that some languages apparently fail to display PCC effects. So making this move will impose the challenge of explaining the apparent exceptions, but that too we will argue can be seen as a consequence of adopting a parsing perspective. The account as given here, though within a formal framework, is largely informal (see Bouzouita 2008a, 2008b, 2011, Bouzouita and Chatzikyriakidis 2009, Cann and Kempson 2008 for detailed lexical specifications, and Chatzikyriakidis and Kempson 2011 for a detailed account of PCC effects in an array of Greek dialects).

2. Background: Latin scrambling puzzles and the emergence of pronominal clitic systems

The background against which this account is set is the challenge posed by clitics, whose positioning and clustering behaviour are problematic, given current theoretical assumptions.

2.1 Clitic mysteries

Pronominal clitics are typically weakened quasi-affixal, quasi-pronominal devices, with a characteristic preference for occurring at some relatively early position in a finite clausal sequence, in some languages immediately following some first constituent or word (as seen in the Baltic languages), in other languages immediately preceding the finite verb (most Romance languages, including Modern Spanish); and yet others with some mixture of the two (Medieval Spanish, Cypriot Greek). The first of these alternatives, the second-position clitic placement, is hosted by a heterogeneous set of categories, commonly including complementisers, *wh*-expressions, negation markers, focused expressions, relative pronouns, verbs (if

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nothing else precedes), and in some cases conjunction markers (see Bouzouita 2008a, 2008b, 2011 for more details for Medieval Spanish):[2]

(6) ... quien **te** algo prometiere ... [Medieval Spanish]
who you.dat something would-promise
'the one who would promise something to you.'

(7) Quant **le** connocio Abdias homillo-**s-le**
when him.acc recognised.3sg Abdias lowered-himself.refl-him.dat
'When Abdias recognised him, he bowed for him.'

(8) Que **te** dixo Heliseus?
what you.dat said.3sg Heliseus
'What did Heliseus tell you?'

(9) Non **los** destroyré [...]
not them.acc will-destroy.1sg
'I will not destroy them [...].'

(10) .ij. mios fijos **te** dexaré [...]
two my sons you.dat will-leave.1sg
'My two sons, I will leave you [...].'

(11) Con aquellas **se** aiunto Salomon [...]
with those himself.refl joined.3sg Salomon
'With those women, Salomon slept [...].'

(12) Oyo-**l** Ruben [...]
heard-3sg.him.acc Ruben
'Ruben heard it [...].'

This set of environments resists any unitary syntactic characterisation, upon conventional assumptions. The puzzle, from a syntactic perspective, is what this array of variation can be grounded in?

Construal of clitics is also puzzling, as, for some clitics, their argument-role is fully determined by their form, but for others it is not. Accusative clitic pronouns in Romance for example are standardly relatively clear-cut in indicating a direct-object argument. Dative pronouns on the other hand invariably display a flexibility in construal which is displayed also in Latin, where the Greco-Latin tradition describes dative NPs as dividing into at least ten distinct types, from the marking of direct and indirect objects through to widely varying semantic uses, including possession, advantage, result and 'interest' (reported in van Hoecke 1996). Latin examples include:

[2] In the main, illustrations are from 13th century Medieval Spanish and are taken from a corpus of Medieval Spanish collected by Miriam Bouzouita culled from the Fazienda de Ultramar, which dates from around 1230. All Medieval Spanish examples given are from this text unless stated otherwise.

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(13) an **tibi** quisquam in curiam venienti
Q you.dat anyone.nom.sg into senate-house.acc.sg coming.dat.sg
assurexit? [Latin]
get-up.3sg.perf
'Did anyone get up for you (to your benefit) when you came into the senate house?' (Cicero *In Pisonem*. 26)

(14) quid **mihi** Celsus agit?
what me.dat Celsus.nom.sg do.3sg.pres
'How, pray, is Celsus?' (Lit. 'What to me Celsus does?'; Horace *Epistolae* 1, 3, 152)[3]

Following this Latin usage, the first and second dative clitic pronouns in the Romance languages are commonly associated with a large number of distinct construals, the particular range varying from language to language, and even from environment to environment. For example, first and second person clitics in (Medieval) Spanish have a single form which may variously be construed as reflexive, direct or indirect object, or as ethical datives (15).

(15) Testimonias **me** sed oy [Medieval Spanish]
witnesses me.dat be.imp today
'Be witnesses on my behalf today.'

Yet another aspect of the clitics puzzle is that where there is more than one clitic in a clausal string, they generally cluster together, so that for any statement purporting to restrict the occurrence of the clitic pronoun to immediately following some preceding category of expression or immediately preceding some verbal form, the statement has to be complicated by the fact that another clitic may intervene between it and such a host (data from Granberg 1988: 132):

(16) e ella dixo-**ge-lo** [...]
and she.nom told.3sg-to-him.dat-it.acc
'And she told it to him [...].'

(17) ca ya non **te** **lo** mandava matar
because already not to-you.dat him.acc ordered.1sg kill.inf
'because I no longer ordered you to kill him.'

Finally, there is the complication that the relative ordering of these clitics may vary between closely related languages and even within a single language without any distinction of interpretation. Of these, perhaps the most striking is French which licenses pairs of third person clitics only in a DO-IO sequence (excluding the order *le lui*), but requires pairs of third and first/second person clitics to occur only in the inverse IO-DO sequence (as in the Spanish example (17)).[4] The basis for such clusterings is thus generally agreed not to have a semantic basis. But there is also morphological idiosyncracy, so that a purely phonological explanation doesn't seem appropriate either – in particular restrictions on Spanish clustering differ according as

[3] The phrase *quid agis?* in Latin is generally used for 'How are you?' or 'How's it going?'.
[4] We do not give French examples in detail, as a DS account of French remains to be developed.

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the neutral dative form *se* is construed as ethical dative, indirect object, or reflexive. There is also notorious variation across dialects, with 'leista' effects in which the dative *le* appears to be spreading to include accusative uses, but with also 'loista' and even 'laista' dialects in which it is rather the masculine *lo* (or the feminine form *la*) which is becoming the form that can cover both direct and indirect object construals (Company 1998).

The intransigence of clitic positioning to syntactic, semantic, or phonological explication has led to debates as to whether these clusters interact with syntactic processes at all. In minimalist analyses, variant clitic properties are seen by some as associated with distinct features, hence distinct triggers for movement, inducing movement of the clitic to the requisite checking site (Cardinaletti 2008), others see them as subject only to feature-geometry forms of explanation (Cuervo 2005, Rezac 2008), yet others a mixture of the two (Adger and Harbour 2007). There have been debates over which clitics should have which features, what processes they trigger and, for those that argue for feature geometries, whether there should be rules making reference to concepts of domination displayed on the feature hierarchy (Heap 2005). In the majority of cases, the specifications proposed lack independent motivation, and so amount to little more than stipulated invocation of syntactic structure or feature geometry to directly reflect the idiosyncratic orders observed (see Chatzikyriakidis 2010 for detailed evaluation of this literature). Cardinaletti's account of the array of idiosyncracies displayed in Italian (Cardinaletti 2008) involves distinguishing *gli* (the realisation of dative *le* when immediately preceding *lo*) as having a +person feature while its alternative realisation *le* has only a +number feature without that person feature. Rivero (2007), in addressing cluster properties in association with Spanish psych predicates, defines a newly distinctive mental-state +m feature, whose positing critically provides the necessary count of feature-strength to determine appropriate orderings on which her account depends. Adger and Harbour and others argue over whether there should be binary Participant, Author, and Hearer features over and above other features assigned, and there are debates as to whether Person should be posited as a feature at all (Anagnostopoulou 2005 "No", Rivero 2007 "Yes" with both overt and covert variants) and over whether features should be binary (the Adger and Harbour 2007 account of the problematic morphological gaps posits both binary and non-binary features). Cuervo (2005) defines template positions onto which feature complexes have to be mapped (eschewing a movement-based account), and though noting the problems raised by morphological gaps, provides no account of them. Against these, structural accounts persist: Ormabazal and Romero (2007) for example argue for an agreement-based account, that for any language displaying VP-internal agreement, no more than one such agreement pairing is possible.

Things are little better in other theoretical frameworks. In optimality theoretic frameworks, for example, the set of constraints defined is highly particular to particular clusterings involving for example PERSONRIGHT, PERSONLEFT, EDGEMOST(Dat), EDGEMOST(Acc), and PARSE constraints (Grimshaw 2001, Legendre 2003), all defined to allow appropriate flexibility under appropriate conditions; but with the consequence that there is no restriction on possible clusterings, the constraints doing no more than matching the facts. In Monachesi (2005) and Anderson (2005), such clustering is taken to motivate the postulation of a morphology component defined as independent of either syntax or semantics, a move which means that lack of independent explanation of the data is turned into a design

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feature of the grammar. Licensed co-occurrences per language are defined as varying morphological templates onto which the language-sequences have to be mapped, with no attempt in that system to explain why such clustering behaviour should occur. The overall impression from this increasing wealth of literature devoted to clitics is that there is little indication of anything approaching a principled explanation.

2.2 Word order variation

There is an unexpected twist on clitic variability which in this paper we wish to bring out. Looked at as a set of distributions, the sequence of clitics with respect to the verb is redolent of the patterning of full NPs relative to the accompanying verb in Latin, occurring regularly before the verb, and restrictedly after it. We shall argue that far from being a trivial observation, this is indeed the source of the explanation.

Latin constituent order variation is syntactically free in simple clauses at least, with NPs able to occur in any order and with any one or more NP able to occur before the verb, or after it. In consequence, there is no apparent indication from the order itself as to how the various parts are to be semantically combined:

(18) Catullus Lesbiam amavit [Latin]
Catullus.sg.nom Lesbia.sg.acc loved.3sg.perf
'Catullus loved Lesbia.'

Lesbiam Catullus amavit
Amavit Catullus Lesbiam
Amavit Lesbiam Catullus
Lesbiam amavit Catullus
Catullus amavit Lesbiam

It is, of course, the case specifications of the NPs which are largely responsible for the construal of the argument roles they project relative to the verb, rather than anything intrinsic to the ordering in the string. And it is these case specifications that get lost in the Romance systems. So it should be no surprise to find parallelism between Medieval Spanish and Latin distributions in the only set of nominals – the clitic pronouns – that retain some aspect of the Latin case system which was otherwise entirely lost. The assumption that case determines construal is however only partially true, in that, as with most case-marking systems, much of the Latin case system is syncretic, with only partial determinism of thematic role from the morphological form of the NP-expressions. Nominative and accusative forms of nouns are syncretic invariably in the neuter (as generally in Indo-European) and also regularly in the plural of the consonant stems. In the development of the Romance languages, phonological changes caused massive syncretism within nominal paradigms giving rise in Vulgar Latin to just two or three forms in many cases. For example, the first declension classical forms *rosa, rosam, rosā, rosās, rosārum* (singular nominative, accusative, ablative and plural accusative, genitive, respectively) are reduced to *rosa* while the late form *rose* stands for the rest of the paradigm, except for the dative/ablative plural. Ultimately, this led to a loss of case distinctiveness amongst the Romance languages (except for Romanian which retains oblique/non-oblique forms in certain declensions), and became general for NPs in Medieval Spanish. Syncretism also affected the weak pronominal system so that in Medieval Spanish some clitics, *me* and *te* amongst others, are not differentiated as to accusative/dative cases.

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Despite such variable determinism in the case system in Latin, word order freedom extends beyond mere local "scrambling", as constituents can be dislocated even across clausal boundaries:

(19) Stercilinum magnum stude ut habeas [Latin]
dunghill.sg.acc big.sg.acc ensure.imp.sg that have.2sg
'See that you have a large dung hill' (Cato *De Re Rustica* 6)

In these classic long-distance dependency constructions, case specifications cannot be seen as contributing anything more than a constraint on their construal, given their arbitrary dislocation from the expression on which they depend.

Nevertheless, despite such flexibility, word order in Latin is very far from being a total free-for-all. Even though more than one constituent can be dislocated and placed at the left periphery, in all cases involving dislocation from an embedded finite clause, there is invariably a restriction that all the constituents so dislocated must be interpreted as local to each other, as in (20, 21):

(20) [Ventus ad praefurnium caveto] ne
wind.sg.nom to furnace-door.sg.acc beware.imp neg-comp
accedat
come-near.3sg.pres
'Take care that the wind doesn't blow on the furnace door.' (Cato *De Re Rustica* 38)

(21) [digitum supra terram] facito semina emineant
finger.sg.acc above earth.sg.acc make.imp seeds.pl.nom/acc project.3pl
'Make the seeds project a finger above the earth.' (Cato *De Re Rustica* 46)

This rigid local pairing of NP-expressions receives an echo in the subsequent clitic systems that emerged, with their rigid ordering before the verb, but essential locality with respect to each other. Until quite recently, surface word order had been taken to be a linearisation matter to be handled as a surface property not impinging on the structural core of syntax-internal mechanisms. But this leaves unexplained the rigid locality of any two such dislocated expressions relative to each other, a pattern that occurs quite generally with clitic sequences which, like multiple long-distance dependencies, cannot be split.

What we argue is that the patterns attributable to scrambling are indeed reflected in the distribution of Medieval Spanish clitics (see also Bouzouita 2008a, 2008b, 2011): and we will sketch an account that formally defines an explanation in these terms. In informal terms, local scrambling requires constructive use of case (Nordlinger 1998), with case specifications determining argument role in the presented structure in an on-line way in Latin. Long-distance scrambling, in which an expression can be dislocated arbitrarily far from its dependency site, indicates to the contrary that some case specifications do not perform any such local constructive role, but merely act as some kind of filter on appropriate identification of where they contribute to the overall structure. Multiple long-distance scrambling, in which pairs of such dislocated expressions may occur together at some early position in a string, can be modelled by

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a mechanism that induces an essentially localised sub-structure, to be resolved in the overall structure as a unit. Finally, parenthetical construals can be available for any expression, so that some expressions can be analysed as in some sense independent of the structure within which they are contained. It is then the effects of these general mechanisms that underpin what has been seen as requiring clitic template specifications, with the various effects displayed in the distribution of clitics being modelled as a calcification of the sequences of actions which had in the earlier Latin system been induced by these general mechanisms, in different combinations.

An account of scrambling has been argued for in detail elsewhere with respect to Japanese and Korean (Cann et al. 2005, Kiaer 2007, Kempson and Kiaer 2010). Our primary aim in the first half of this paper is to show how that account as applied to Latin can be used as a basis for explaining clitic behaviours in Romance as the freezing of a set of parsing strategies, with the Person Case Constraint on clitic clustering effects explained as a result of the general tree-growth restriction preventing any of the offending clusters from ever emerging, notwithstanding the existence of apparently systematic exceptions.

3. Towards a Dynamic Syntax of Latin

The novel property of Dynamic Syntax as a syntactic theory is that the concept of structural underspecification and growth of interpretation intrinsic to processing is taken as the core syntactic notion. The syntax of the natural-language system is thus defined as a set of strategies for establishing the interpretation of some string of words in the order in which they appear, reflecting possibilities for choice in on-line parsing. The process involves the incremental development of tree structures representing a semantic interpretation for a string which are decorated by labels that progressively provide the information needed to determine the appropriate interpretation. Generation is defined in exactly the same terms: the very same rules apply in production as in parsing, the only difference between production and parsing being that whereas the parser may not know in advance the interpretation to be constructed, the producer in contrast must do so (Purver and Otsuka 2003, Purver et al. 2006). Hence, in generation there is from the outset a 'goal tree' which represents the interpretation to be conveyed, together with a defined constraint that in generation, each update step licensed by the parsing mechanism has to constitute an enrichment towards completing that 'goal tree' (formally a subsumption relation is required to hold between the parse tree and the goal tree; Purver and Otsuka 2003).

As the basis of the processing system is parsing, we begin by defining the general parsing strategies used in the framework. The starting point of this process is a tree with just a rootnode and a requirement to construct some propositional formula. The endpoint is a fully decorated binary branching tree structure encoding functor-argument structure of a familiar sort.[5] As figure 1 displays, each completed interpretation is represented as a binary-branching tree whose rootnode is the propositional formula established and its daughter nodes the various sub-formulae that together yield this formula.

[5] *Fo* is a predicate that takes a logical formula as value, *Ty* a predicate that takes logical types as values, *Tn* a predicate that takes tree-node addresses as values, e.g. *Tn(0)* being the rootnode. In general we omit the *Fo* predicate in tree diagrams for simplicity. The ◊ is a pointer, indicating the node currently under development.

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The process of tree-growth is the sole basis of syntactic explanation: a sentence is defined to be wellformed just in case there is at least one possible route through that process that leads to a complete propositional tree with no requirements outstanding (see below).[6] Tree growth involves the emergent unfolding of partial trees, whose node-relations and node-decorations all get progressively specified. Transition steps between partial trees are determined by a combination of general computational actions and lexical actions that are triggered by parsing words in the order in which they are presented in some string, together defining a monotonic process of tree-growth. These computational and lexical actions are expressed in exactly the same terms, that of growth along any of the dimensions associated with decorations on the trees defined by the system. Moreover, both sets of actions are defined using exactly the same vocabulary[7], allowing in principle for a sequence of computational actions to become associated with particular lexical items and subsequently stored as a lexically defined tree-update. The only essential differences between computational and lexical actions are that the former are, without exception, optional and not triggered by particular phonological (or orthographic) input, while the latter are so triggered and the actions they determine must be run.

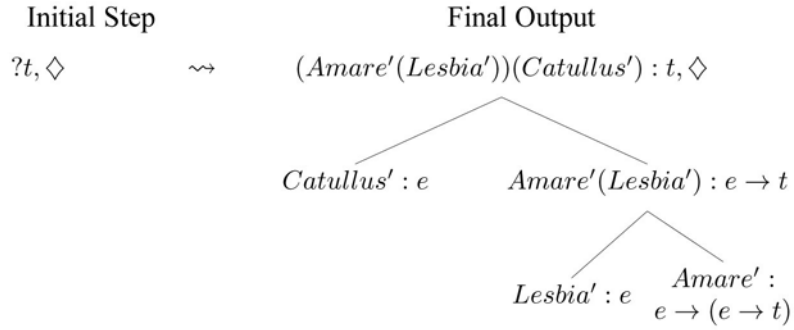


Figure 1: Parsing *Catullus Lesbiam amavit* 'Catullus loved Lesbia'.

Any aspect of tree construction or decoration may be partial. Accordingly, tree-relations, tree-decorations, type and formula specifications may all be only partially specified. Central to this process is the concept of requirement ?X for any decoration X representing a type, formula or treenode address. For example, decorations on nodes such as *?t, ?e, ?e → t* etc. express requirements to construct formulae of the appropriate type on the nodes so decorated; *?∃x.Fo(x)* a requirement to provide a fixed formula specification; and *?∃x.Tn(x)*a requirement to provide a fixed treenode address. The underpinning formal system is a logic of finite trees (LOFT, Blackburn and Meyer-Viol 1994) with two basic modalities,⟨↓⟩ and ⟨↑⟩, such that ⟨↓⟩α holds at a node if α holds at its daughter, and its inverse, ⟨↑⟩α, holds at a node if α holds at its mother. Function and argument relations are distinguished by defining two types of daughter relation, ⟨↓$_0$⟩ for argument daughters, ⟨↓$_1$⟩ for functor daughters (with their

[6] Quantification is expressed in terms of variable-binding term operators, so that quantifying NPs like all other NPs are of type e. The underlying logic is the epsilon calculus, the formal study of arbitrary names, with term-expressions whose internal structure is made up of an epsilon binder, ε, a variable, and a restrictor: e.g. ε, x, Man'(x). Since in Latin, nouns project full specification of terms, the structure defined to be projected by *servum* would be a subtree of which the quantifying term is the topnode, dominating a subtree decorated with binder, variable, and restrictor specification. We leave all details on one side.

[7] This departs from the notation in Kempson et al. (2001) and Cann et al. (2005).

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inverses$\langle\uparrow_0\rangle$, $\langle\uparrow_1\rangle$). Domination relations are then definable through Kleene star operators, e.g. $\langle\uparrow^*\rangle$*Tn(a)* for some node identified as dominated by treenode *Tn(a)*; a node decorated as $\langle\uparrow^*\rangle$*Tn(a)*,?$\exists$*x.Tn(x)* is a node that is dominated by some node *Tn(a)* along some arbitrary sequence of mother relations. Such modal statements can be used to formulate requirements. These may be general, e.g. the requirements on an introduced proposition-requiring node for an argument-daughter node and a predicate-daughter node: such a node would be decorated with ?*Ty(t)*, ?$\langle\downarrow_0\rangle$*Ty(e)*, ?$\langle\downarrow_1\rangle$*Ty(e* $\rightarrow$ *t)*. Such requirements constitute subgoals on a wellformed derivation, and are filters on the output.

Requirements may also however be defined as lexically imposed filters on output: and this is the initial basis for modelling case specifications where this is structurally definable. For example, a nominatively marked expression is defined as projecting onto a subject node of the emergent tree an output filter requirement of the form ?$\langle\uparrow_0\rangle$*Ty(t)* (the requirement that its immediately dominating node be of a formula of type t); an accusatively marked expression projects onto the immediate argument-daughter node of some emergent predicate-requiring node the requirement ?$\langle\uparrow_0\rangle$*Ty(e*$\rightarrow$ *t)*. Thus case specifications, like all other generalisations, are expressed in terms of possible forms of tree growth. And so it is that a range of what in other frameworks are taken to be morphological or syntactic properties can in this framework be expressed as requirements on growth of semantic representation.[8]

Restrictions at the interface of syntax and semantics are also naturally expressible in these terms. An uncontroversial aspect of underspecification of content is that associated with anaphoric expressions, their intrinsic contribution to interpretation being that they provide only some partial specification of any occasion-specific interpretation, the particular value being determined by the context relative to which the uttered expression is understood. In this representational perspective, this is expressed by defining all such context-dependent expressions as projecting an interim place-holding device, adding to the basic Formula vocabulary the metavariables **U**,**V**.., each associated with a requirement for a fixed value to be provided either from the context so far accrued in the interpretation process or subsequently from within the construction process. Whatever restrictions there are on the domain within which individual anaphoric expressions have to be construed are also defined in tree-growth terms as constraints on the (sub)-tree within which the values of metavariables have to be found. For example, in the case of reflexives, the value for the projected metavariable has to be found at some node *Tn(a)* along a path $\langle\uparrow_0\rangle\langle\uparrow_1{}^*\rangle\langle\downarrow_0\rangle$*Tn(a)* from the node being decorated by the reflexive – that is from some co-argument along some unspecified but uninterrupted functor spine. Conversely, metavariables projected by pronouns cannot take such a local value, a constraint expressed as part of the process of substitution (see Kempson et al. 2001: 97).

[8] The specification of case in these terms is naive in the sense that it assumes that particular cases determine directly the semantic function of the term projected by some noun phrase. This is not generally true (e.g. nominative expressions may be a semantic object in some passive constructions while other cases have 'semantic' counterparts). Some effects of this are noted below, but a more sophisticated theory of case in DS remains to be articulated.

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3.1 Scrambling

More controversially, the very same perspective is adopted with what in other frameworks is taken to constitute evidence of either feature passing (Sag et al. 2002) or syntactic movement (e.g. Hornstein et al. 2005). Instead of positing morphologically empty sites in a string which are paired with some non-contiguous (left-peripheral) expression as a basis for articulating the contribution of that expression to interpretation of the string, a parsing-based perspective that follows the dynamics of processing of strings in real time presents such dislocated left-peripheral expressions at the early point in the string as associated with underspecified structural information that has to be updated later. Matching this explanation, one core mechanism is the license to construct a node dominated by some proposition-requiring node whose tree-relation is not fully specified with respect to that node. This is achieved by a rule of *Adjunction (read 'star-adjunction') which creates an "unfixed" node with precisely this property, described in the tree-logic language as $\langle\uparrow^*\rangle Tn(a)$ with respect to some treenode *Tn(a)*. The exact role of such unfixed nodes is thus not specified at the point of introduction in the emergent tree structure, but is required to be determined at some later stage in the grammatical process by an enrichment process updating that underspecified relation to a fixed relation identifying its role as subject, direct-object, or indirect object.

There is also a more locally restricted process of introducing unfixed nodes (Local*Adjunction), for which an argument-node is constructed that is also underspecified with respect to some type-t-requiring node but with a tighter constraint that this relation be within the subtree from the node from which the underspecified tree relation is constructed. This is characterised on its introduction as having a modality $\langle\uparrow_0\rangle\langle\uparrow_1^*\rangle Tn(a)$ with respect to some treenode *Tn(a)*. This specifies that the unfixed node is an argument ($\langle\uparrow_0\rangle$) that is related to an unspecified series of functor nodes to the dominating node ($\langle\uparrow_1^*\rangle$). This has the effect of ensuring strict locality within a single predicate-argument array. Both underspecified tree relations are twinned with a requirement for update ($?\exists x.Tn(x)$) so that a subsequent fixed tree-node relation must be provided in all wellformed derivations.

There are limits on how such underspecified relations can be constructed. A defining property of trees and the nodes they contain is that a node in a tree is uniquely defined by its relation to all other nodes in the containing tree (Blackburn and Meyer-Viol 1994). This has a consequence for the tree construction process that there can only be one unfixed node of a type at a time in any partial tree, as all such nodes are characterizable only by their relatively weak modality. This is not a constraint that has to be externally imposed: any duplication of some tree relation simply induces the immediate collapse of any such putative pair of nodes, which invariably leads to an incoherent treenode decoration unless the individual decorations of the duplicated nodes are compatible. It is this constraint, as we shall see in due course, that underpins Latin word order effects, restrictions on clitic cluster combinations in Romance and also Bantu object marker restrictions.

A common basis for cross-linguistic variation is the minor variation that lexical actions for related categories of expression in the differing languages may display. For example, with its relatively free word order and possibility of pro-drop, the parsing of a Latin verb induces a propositional structure whose argument nodes are decorated with metavariables, $\mathbf{U}_{3sg.}$, **V**...., capturing the effect of null pronouns in such languages

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without the assumption that these exist as parts of a linguistic string. The lexical entry in (22) illustrates the actions to be carried out by a parse of *amavit* 'loved', with the resulting partial tree shown in Figure 2 below.[9]

(22) *amavit*
IF ?*Ty(t)*
THEN put(*Tns(PAST)*);
make(⟨↓$_0$⟩);go(⟨↓$_0$⟩);
put(*Ty*(*e*), *Fo*(**U**$_{3sg}$),?∃*x.Fo(x)*);
go(⟨↑$_0$⟩); make(⟨↓$_1$⟩);go(⟨↓$_1$⟩);
put(?*Ty*($e \rightarrow t$));
make(⟨↓$_1$⟩);go(⟨↓$_1$⟩);
put(*Fo*(*Amare'*),*Ty*($e \rightarrow (e \rightarrow t)$),[↓]⊥);
go(⟨↑$_1$⟩);make(⟨↓$_0$⟩);go(⟨↓$_0$⟩);
put(*Fo*(**V**), *Ty*(*e*),?∃*x.Fo*(*x*))
ELSE Abort

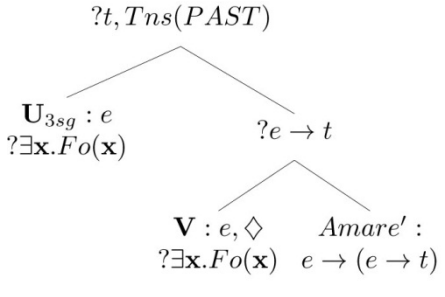


Figure 2: Parsing *amavit*

This property is not shared by verbs in non-pro-drop languages whose argument nodes, as projected from the verb, bear the weaker characterisation of the requirement ?*Ty*(*e*), without metavariables, thereby imposing the requirement of morphologically explicit argument expressions.

Given the common language of lexical and computational actions, the lexical projection of propositional structure by a verb freely interacts with the construction of nodes, for example by application of Local*Adjunction prior to the parse of a verb, where scrambling effects are driven by constructive use of case.

(23) Lesbiam Catullus amavit
Lesbia.acc Catullus.nom love.3sg.perf
'Catullus loved Lesbia.'

Despite case specifications being defined to ensure that the term projected by some nominal expression is fixed in an appropriate position as an output filter, nothing

[9] The applicability of specific rules or lexical actions depends on appropriate positioning of the pointer, ◊, and while there is considerable freedom of the pointer back down a tree in anticipation of further development of nodes, movement of the pointer up the tree is highly restricted, and possible only if the type-requirement on some node has been satisfied, and then, only to the immediate mother node or, in the case of unfixed nodes, to the node from which the underspecified relation was constructed.

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prevents early update of the underspecified tree relation, by constructive use of case that guarantees the ultimate satisfaction of the output filter. The succession of steps required for the processing of (23) begins with the parsing of the accusative noun *Lesbiam* as decorating a locally unfixed node, followed by a series of steps of abduction to ensure that the accusative case constraint will be satisfied during the parse. Abduction proceeds in two steps: from the case constraint $?\langle\uparrow_0\rangle Ty(e\rightarrow t)$ on the argument-node to an annotation on the mother $?Ty(e\rightarrow t)$, to ensure that the accusative requirement is satisfied; and then from $\langle\uparrow_1{*}\rangle Tn(0)$ to $\langle\uparrow_1\rangle Tn(0)$ to satisfy the tree-node requirement on the functor node.[10]

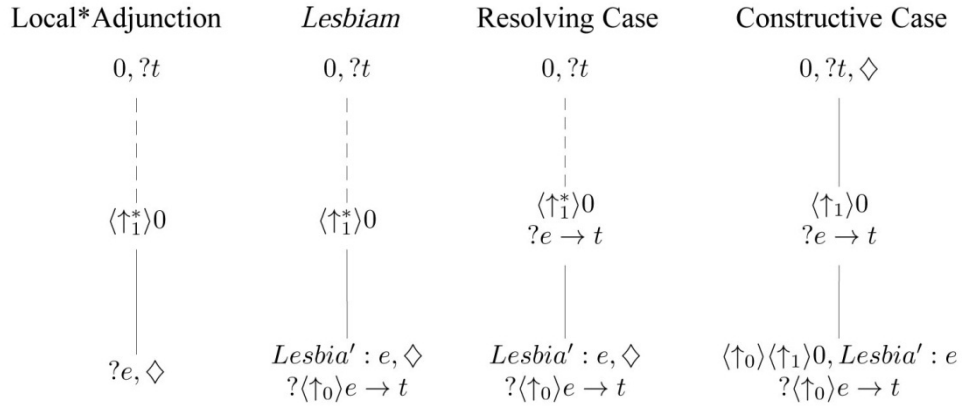


Figure 3: Parsing *Lesbiam* with constructive case.

A second step of Local*Adjunction takes place, and the parsing of *Catullus* is then taken to fix the value of the underspecified tree relation $\langle\uparrow_0\rangle\langle\uparrow_1{*}\rangle Tn(0)$ of Local*Adjunction into $\langle\uparrow_0\rangle Tn(0)$ providing the basis for satisfying the nominative-induced requirement $?\langle\uparrow_0\rangle Ty(t)$:

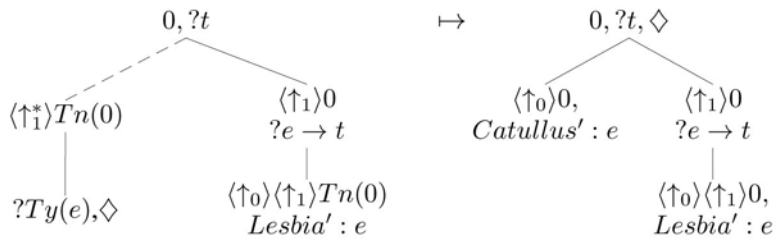


Figure 4: Parsing *Lesbiam Catullus*

The result is that the relation between the argument node and the dominating node is fixed at the point of parsing the noun phrase, possibly well before the verb is processed. The output-filter restrictions of case-specifications serve thus to induce the update of an unfixed node to a fixed relation as each unfixed node is introduced. The actions of the verb then serve to fill out the remainder of the propositional structure to yield the appropriate output tree. These lexical actions operate exactly as before,

[10] This sequence of steps can apply to all argument relations including subject: the Kleene* intrinsic to defining $\langle\uparrow{*}\rangle$ and other operators is satisfied by the empty set, so $\langle\uparrow_0\rangle\langle\uparrow_1{*}\rangle Tn(a)$ is true also of the subject relation.

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giving rise to a duplication in the description of the tree of both subject and object nodes with the already constructed nodes being matched with nodes decorated by metavariables. This duplication of nodes harmlessly collapses into a single description for each affected node because metavariables are not part of the object language of formulae, but merely place-holders for such formulae. Therefore, the effect of the nodes constructed from parsing the two initial noun phrases is to provide the values for the metavariables projected by the verb.

The restriction that there can be only one unfixed node at a time remains satisfied, despite the application of procedures to build these nodes twice over. Nothing dictates which of these argument expressions is placed first, so the sequence of actions involving Local*Adjunction followed by a tree-update process reflecting the particular case specification can occur in any order, reflecting the freedom of constituent order which Latin displays.[11] Given the restriction to only one unfixed node of a type at a time, this type of derivation is available only upon the assumption that on-line update of the tree relation is available, so no particular fixing of rule-order application is required: all other derivations will be precluded. And so it is that successful derivations to yield an interpretation of examples such as (23) can be built up incrementally.

This is by no means the only type of tree-growth sequence however. The first expression *Lesbiam* might be taken to decorate an unfixed node introduced through the non-local step of *Adjunction. In this case, by assumption, the case specification serves merely as a filter on update that is not immediately enriched to a fixed position, and in consequence no other unfixed node can be introduced by this step. As a discrete operation, Local*Adjunction nevertheless remains available for the processing of some matrix subject NP that might follow (*Catullus* in (23)). The consequence is that the sequence of strategies for constructing a string-interpretation pairing is by no means unique. Indeed arguably the only major difference in the way *Adjunction and Local*Adjunction apply lies in the fact that immediate case-update to a fixed tree relation cannot take place in the former, because there is no presumption that the term is local to the primary predicate-argument array.

Unlike this alternative derivation of (23), a derivation involving *Adjunction is of course needed essentially for dependencies that are not local as in (19).

(19) Stercilinum magnum stude ut habeas
dunghill.sg.acc big.acc ensure.imp.sg that have.2sg.pres
'See that you have a large dung hill'

Furthermore, this similarity of processes underpinning long-distance and short-distance scrambling effects provides an immediate explanation for multiple long-distance dependency effects. With both processes involving the building of an unfixed node, we expect the possibility of a feeding relation between *Adjunction and Local*Adjunction, resulting in multiple long-distance dependency as in (21):

[11] Equally, such NPs could be placed after the verb, since both for the application of the actions triggered by the verb and for applicability of Local*Adjunction, the pointer needs to be at the type-t-requiring node. We leave all details about post-verbal clitic placement for another occasion. In rigid verb-final languages, it is the details of tense-specification which ensure finality of the verb (see Cann et al. 2005, Kempson and Kiaer 2010).

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(21) [digitum supra terram] facito semina emineant
finger.sg.acc above earth.sg.acc make.imp seeds.pl.nom/acc project.3pl
'Make the seeds project a finger above the earth.'

In the DS account, such patterns are directly expected. *Adjunction would allow the construction of a propositional unfixed node decorated with the requirement ?Ty(t). Within in this unfixed propositional domain successive steps of Local*Adjunction may apply to construct partial propositional structures to be associated with the first two constituents in (21), on the assumption that prepositions can play the role of case in determining additional arguments for the accompanying predicate, yielding partial trees such as figure 5.[12] In this way a sequence of argument nodes can be constructed. The position of the cluster of argument nodes is then resolved at a subsequent point in the construction process, in (21) with introduction of the propositional complement argument of *facito* to yield the tree in figure 6.

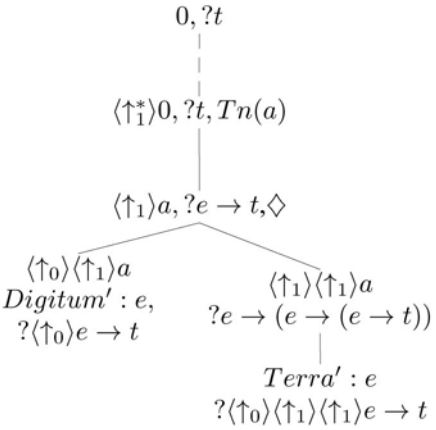


Figure 5: Parsing *Digitum (supra) terram.*

[12] On this analysis, we assume an account of prepositional phrases following Marten (2002), in which prepositional phrases function as optional arguments, and here we simply stipulate the relation of *supra terram* as being that of third argument for some upcoming predicate. Many details of the analysis are omitted here, including the way in which the effect of the preposition is to over-ride the otherwise default construal of accusative as the highest argument within the predicate structure. The essence of the analysis stands, however.

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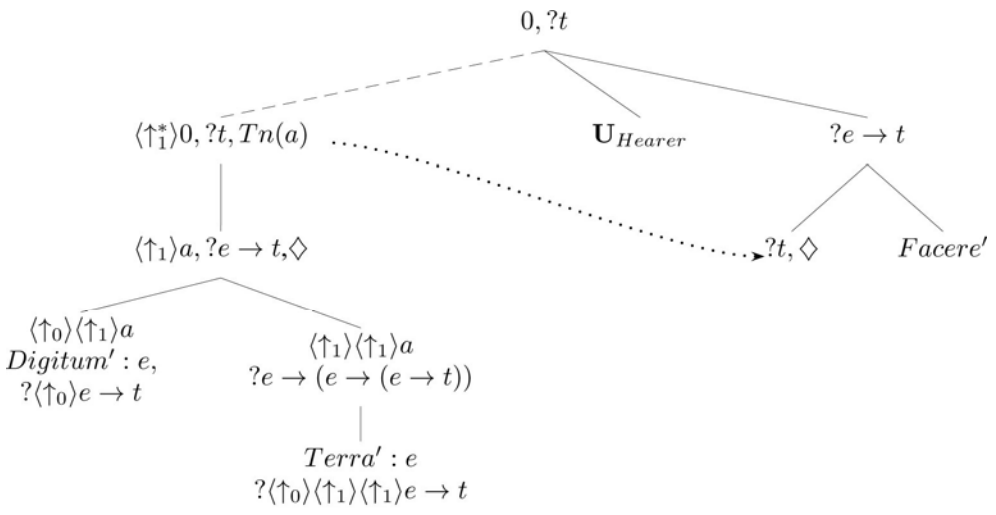


Figure 6: Parsing *Digitum (supra) terram facito.*

What is notable about such intermediate structures in the present connection is the construction of proposition-requiring structures which, at some intermediate juncture, may contain only an array of argument nodes, as yet lacking the predicate node which is essential to completing that structure.

There is one further general tree-construction strategy yet remaining before we have anything approximating to a complete sketch of the mechanisms which the DS framework licenses. There are also mechanisms for building paired structures, where structures are taken to be twinned by being the result of a construction process which ensures the sharing of some term in two such so-called linked trees. This process is defined in DS for construal of relative clauses, clausal adverbials, and also external topic constructions. Such secondary structures may have an attendant requirement that the newly introduced proposition-requiring tree have somewhere within it a copy of that term (specified as ?⟨↓*⟩*Fo*(α): see Cann et al. (2005) for details).[13]



Figure 7: Building Link transitions

The significance of this process for the overall DS perspective is that it extends the range of alternatives whereby strings can be processed, so leading to an additional possible structure as a form of interpretation, without thestring itself necessarily displaying an overt reflex of this additional alternative. For example, in a pro-drop language, such a linked structure may indeed be decorated with a term provided by a full NP, with the requirement that it be identified with one of the arguments of the subsequent structure. They can be satisfied by information provided by the verb, hence without need of any morphologically explicit anaphoric device. And should the

[13] The process of inducing such pairs of semantic trees is permitted by defining an additional modal operator in the tree logic ⟨L⟩, and its inverse ⟨L^{-1}⟩; and a rule is defined to yield a transition from an arbitrary node in one tree across a Link relation to the topnode of a new tree of whatever type.

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NP taken to decorate the linked structure be a dative clitic pronoun, it may constitute some additional add-on to the remainder of the clausal sequence, without any further duplication of the information that it provides. Consider how the analysis of (14) (repeated here) might proceed.

(14) quid **mihi** Celsus agit?
what me.dat Celsus.sg.nom do.3sg.pres
'How, pray, is Celsus?' (Lit. 'What to me Celsus does?')

Parsing the interrogative *quid* proceeds via *Adjunction to give an unfixed node and then, since all computational actions are optional, one move could be to construct a node linked to the main propositional node with the requirement to construct a term (?*Ty*(*e*)). The dative pronoun is parsed and the node is decorated with the name of the speaker, here assumed to be Horace (figure 8).[14]

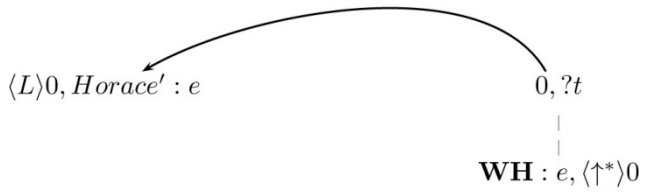


Figure 8: Parsing *quid mihi.*

By assumption, in this context, the term projected by *mihi* and identified as picking out the speaker, here assumed to be Horace, is not in this linked structure associated with a case constraint to find a particular function for the term so constructed (a polysemy effect which we shall see persists in Spanish); and the parse of the main clause continues. We end up with a tree like that in figure 9 indicating that the speaker, Horace, is only tangentially associated with the event denoted by the main verb, allowing, through normal inference driven by relevance considerations, a broad range of relations to be construed between Horace and what he has said.

[14] In this analysis, no term is shared between the linked structure and the main proposition, making it like an analysis of gapless topics in languages like Chinese (Wu 2005).

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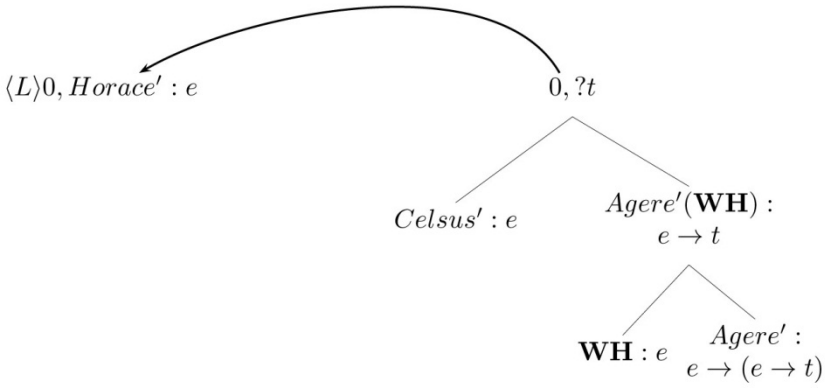


Figure 9: Parsing *quid mihi Celsus agit.*

The consequence of this flexibility is that there are a number of moves available at any stage of a parse sequence, in particular in the early stages when so little structural specification is as yet determined.

3.2 Processing pressures, word order and pragmatics

We now turn to how performance considerations might dictate preferred choices amongst these alternative strategies. General constraints on production and parsing will ensure that speakers and hearers maximise the use of context to cut down the need to search the lexicon for words expressing appropriate meanings or to employ inference to determine what is being conveyed. In particular, according to Relevance Theory (Sperber and Wilson 1995), with its trade-off between cognitive effect and expenditure of effort, pragmatic processes of utterance interpretation will tend to encourage the appearance of given material early on in a clause. Such positioning provides a means of minimizing the search within a given context to establish construal of pronominals as early as possible. This is of course no more than a relevance-based explanation of this well known given-before-new ordering.

However, to see the link between scrambling effects and clitic template restrictions, there is yet more to be said. In particular, different uses of pronouns in Latin developed into discrete encodings in the subsequent Romance languages. In the earlier Latin system, pronouns, like other nominal constituents, could be used either to provide some initial term which constitutes a point of departure for what follows, or to provide a contrast, an update to what follows. From a DS perspective, the first such effect would constitute the projection of a pair of independent linked structures, the second structure to be developed relative to the context provided by the first with a requirement of a shared term in the tree to be constructed. The second type of construal would involve the construction of an unfixed node by *Adjunction, decorating this with the term indicated by the initially placed expression, with anticipation of delay in updating this initially constructed node (see Cann et al. 2005). Both such devices are non-canonical in projecting structure that is not definitively local, and hence are characteristically associated with stress or distinguishing intonation as a signal that some non-canonical form of construal is required.[15] Of

[15] It has been argued in detail by Kiaer (2007) in connection with Korean that distinctive intonation is an important determinant of appropriate strategies for build up of the intended form of interpretation, in

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course, we have no direct evidence of stress or prosody for a language such as Latin, but at the very least such contemporary evidence is suggestive:[16]

(24) A: **Tibi** ego dem?
2sg.dat 1sg.nom give.1sg.sbj.pres
B: **Mihi** hercle uero
1sg.dat by.Hercules in.truth
'A: Am I to give it to YOU?'
'B: Yes, by god, to ME.' (Plautus *Pseudolus* 626)

(24), for example, could be analysed in DS terms as being associated with the construction of a node introduced by *Adjunction to be decorated by a term representing the hearer.[17] Such a device induces actions that by definition mark an emergent propositional boundary, being associated with introduction of a proposition-requiring node (decorated with ?Ty(t)) without any decorations other than the imposition of such a requirement. If, in anticipation of explaining the split that occurred between stressed and unstressed uses of pronouns, we turn to what the non-stressed uses of pronouns have in common, it is simply that they will lack this property: they will not be associated with those very structural devices which serve to identify some initiation of an emergent propositional structure, they will solely have a regular anaphoric function of context dependence. An interesting example of this occurs in (25) in which a strong pronoun (*ego*), appears immediately before the two weak pronouns (*te*, *ei*):

(25) quod scribis de illo Preciano iure consulto,
what write.2sg.fut about that.sg.abl Precianus.sg.abl jurist.sg.abl
ego **te** **ei** non desino commendare
1sg.nom 2sg.acc 3sg.dat not abandon.1sg.pres commend.inf
'Whatever you write about that jurist, Precianus, I do not stop recommending you to him.' (Cicero *Ad Familiares* 7.8.2)

The strong pronoun *ego*, by analysis, decorates an unfixed node as the initial step in constructing some novel propositional structure following on from the building of an adjunct linked structure, and this choice clearly reflects a clearly emphatic form of construal. The actions of the weak pronouns that follow are then part of the progressive construction of this introduced structure, building, decorating and updating locally unfixed nodes.

Strong pronouns are of course not the sole means of introducing novel propositional domains. Other linguistic indicators of the emergence of a propositional structure include focused noun phrases, expressions containing a negative element, relative pronouns (26), complementizers (27), subordinate temporal adverbials, and verbs (28): indeed this is the only property common to this structurally heterogeneous set (examples culled from Adams 1994). Like their "strong" counterparts, positioning of

particular to signal long-distance dependency effects, that depend on departing from the canonical build up of information locally.

[16] The pronouns noted in (24) are taken by Adams (1994:104) to be illustrative of an emphatic use "often marked by placement of the pronoun at the head of its clause".

[17] The verb is omitted because the predicate, like the structural patterning, is recoverable from the context.

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pronouns under this use will be driven by relevance considerations for these, by assumption, areever-present. This provides the functionalist underpinnings that explain the weak pronoun usage:[18]

(26) quae **tibi** nulla debetur
which.neut-pl 2sg.dat no.neut-pl is-owed
'Nothing of which is owed to you.' (Cicero *Ad Atticum* 1.16)

(27) rogo ut **mi** mittas dalabram
ask.1sg.pres that 1sg.dat send.2sg mattock.acc.sg
'I ask that you send to me a mattock.' (Terentianus 251.27)

(28) delectarunt **me** tuae litterae
delighted.3pl.pres 1sg.acc your letter.nom.pl
'I was delighted with your letters.' (Cicero *Ad Familiares* 9.16.1)

What these share is the characteristic that, once an emergent propositional structure is identified by some other expression, they will get placed as closely following as possible, decorating some locally unfixed node duly updated through its case specification, and so, like the strong pronouns, hugging the left edge of any such emergent structure as closely as commensurate with them not constituting a stressed/contrastive use.[19]

4. Latin to Medieval Spanish

We now have everything in place to sketch out the assumptions a parsing perspective on grammar formalisms would lead us to expect in the explanation of the emergence of the clitic systems of the Romance languages from Latin. Medieval Spanish contains a codification of what had become two phonologically and functionally discrete uses of earlier pronominal forms: strong and clitic. What the clitic pronouns display is two distinct types of property: where they occur in a string, and what kind of tree update the clitic induces. On the one hand, since they constitute the only remaining reflex of earlier nominal case-marking, it is their triggers that are a direct reflex of the earlier set of environments that yielded pragmatic identification of propositional boundary marking, now encoding this information directly as calcified reflexes of that earlier more liberal system. Their positioning is like that of weak pronouns in Latin, i.e. following focussed elements, negative elements, complementizers, relative pronoun subordinators and verbs (for a detailed account see Bouzouita (2008a) from which these data are taken):

(29) Esto es el pan de Dios que **vos** da a comer
this be.3sg the bread of God that you.dat give.3sg to eat.inf
'This is the bread of God that he gives you to eat.'

[18] Examples of the other types of left-edge identifiers can be found in Bouzouita (2008a, 2008b, 2011) and Cann and Kempson (2008).

[19] Following Sperber and Wilson (1995), if there are specific inferential effects to justify commensurate enlargement of the context to be searched, this would explain the lack of tight correspondence between weak pronoun positioning in Latin and any fixed second position noted by Adams (1994), even assuming that such putative second-position effects are clause by clause (or "colon" by "colon" to use his terminology).

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(30) e dizie que **lo** tenie del prior de Sancti Johannis
and said.3sg that it.acc had.3sg of-the prior of Saint John
'And he said that he got it from the prior of Saint John.'

(31) Connocio-**la** Jacob
recognised.3sg-her.acc Jacob
'Jacob recognised her.'

In Latin, as we have already seen, a sequence of NPs (Devine and Stephens 2006) can cluster before the verb, and this pattern too emerges in Medieval Spanish with the clitic pronouns:

(32) Et los dioses **me** quisieron mal e **me** **lo** quieren
and the gods me.dat wanted.3pl harm and me.dat it.acc want.3pl
'And the gods wanted to harm me and they (still) want to.'

4.1 Placement of clitic pronouns: the production pressures

On the other hand, the structural relations induced by the clitic pronouns also show similarity to NP distribution in Latin, and this is not just a trivial continuation of fixed argument relations associated with individual clitics, for though some induce a fixed node for a given argument relation, others induce an underspecified node without fixing the argument relation, and yet others induce pairs of nodes. Rather, the range of update actions provided by the clitics matches the variation in update actions which a sequence of computational actions plus lexical actions provided in the earlier Latin system. First, there is the building of a fixed tree relation. The accusative clitic displays a fixed interpretation corresponding to the construction of a fixed structural relation, with the non-syncretic accusative forms, *lo*, *los*, and their feminine-marked counterparts signalling only direct object function (data from Granberg 1988: 135):

(33) Al senor **lo** faras
to.the gentleman it.acc you-will-do
'You will do it to/for the gentleman.'

(34) cuando **lo** ganó
when it.acc won.3sg
'When did he win it?'

These echo the earlier free availability of Local*Adjunction plus abductive update, here apparently lexicalised into a macro of actions leading directly to a fixed tree relation (see also Bouzouita 2008a, 2008b). Given that the only difference between computational and lexical actions may be that the actions in question become associated with a lexical trigger, the construction of a fixed tree relation is only one such possibility. There is also the action of constructing a locally unfixed node as though by Local*Adjunction. And, in this connection, the dative clitic and the first and second person clitics arguably induce the construction of an underspecified structural relation, displaying, as they do, a large range of interpretations. The consequence of this lack of determination of interpretation is that their contribution to

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the emergent structure may not be able to be determined immediately, but only in combination with the verb with which they are associated:[20]

(35) Yo **vos** defiendo que non vengades y mas et
1.sg.nom you.dat insist that not you-come and more and
si non yo **vos** cegaré et **vos** mataré
if not 1.sg you.acc I-will-blind and you.acc I-will-kill
'I forbid you to come and if not, I myself will blind you and kill you.'

In (35), the first occurrence of *vos* is construed as indirect object, the second and third as direct object; but the morphological input is undifferentiated between these, suggesting that these reflect the construction of a locally unfixed node without update, leaving the relatively weak structural relation having to be updated by the later projection of structure by the verb. And finally there are the clitic clusters, which occur in the same relative position as the singleton occurrences, sometimes written as a single item, inducible as an individualised lexical sequence of actions reflecting the earlier building of construals of clustered NPs by a combination of *Adjunction and sequenced combinations of Local*Adjunction plus update, all listed as a single lexical entry with actions to induce the construction of a cluster of argument terms/nodes.

The range of effects we see displayed in the clitic pronouns of Medieval Spanish is thus broadly the range of effects seen in local scrambling in Latin. This is precisely what we would expect in a transition in which the availability of case specifications on a general basis disappears, being replaced by case specifications only within the pronominal system. As noted above, in the DS framework, general computational actions and lexical actions are expressed in exactly the same terms. Lexical actions, like their general counterpart, characteristically induce the construction of nodes in some partial tree in addition to providing decorations for the nodes which the actions associated with the word in question trigger. Thus a shift in tree-update actions from a sequence of general actions inducing nodes for which words provide decoration to a macro of actions associated with an individual word inducing both structure and decorations is exactly what one might expect in a shift from general to lexically triggered actions. And in this shift, any one word would normally be associated with only one such sequence of actions (unless its precursor in the source language was ambiguous): and so it is that the various clitic pronouns reflect one or other such action-sequence. Seen in processing terms, the clitic-template phenomenon is thus a freezing of scrambling strategies, hence explicable as a progressive shift, each lexical specification reflecting one of a set of strategies for early NP placement.

4.2 The Person Case Constraint explained

But we can go further than this, as we now have a ready explanation of the Person Case Constraint. This, recall, was the non-cooccurrence of first and second person clitics, and the non-cooccurrence also of first/second person clitics with a third-person dative clitic. Both variants of the Person Case Constraint now fall into place: the morphological gaps follow from the tree-logic restriction that there can be no more than one underspecified tree relation of a type at any point in the tree-growth process. The power of this explanation is that it automatically provides an explanation for why

[20] Notice in (35) the initial strong pronoun *yo* 'I', in contra-distinction to the weak form *ho* in the following conjunct.

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the gaps in the clitic template possibilities associated with the Person Case Constraint do not occur.

4.2.1 The Strong Person Case Constraint

Let us take the more comprehensively satisfied restriction first, the preclusion of any co-occurrence of first or second case specifications construed as DO with a third person dative specification construed as IO (the so-called strong form of the Person Case Constraint taken to hold whether or not the form is syncretic: Bonet (1995), Nevins (2007), Ormabazal and Romero (2007)). Recall that there was no need of stipulation that there should be only one unfixed node of a type at a time: in all putative cases where more than one such underspecified tree-relation might be introduced, they collapse as undifferentiatable, with all cases where the resulting treenode decoration is inconsistent being necessarily debarred. This is precisely the scenario which these morphological gaps present. Given the analysis of dative as intrinsically underspecified as to whether the node being decorated is a direct or indirect object (or a semantically weak adjunct), the syncretic first and second person forms will be predicted not to co-occur with any such form, irrespective of order, since they too have a form that fails to discriminate between the various argument roles they can satisfy. Upon an analysis of tree growth that reflects this underspecification, both must be taken to decorate a locally unfixed node. Neither 1st or 2nd person markers could accordingly ever be constructed together with a third person dative marker, let alone be constructed sufficiently often to get routinized into a stored clustered form: both are defined as inducing the construction of a locally unfixed node without any case basis for inducing appropriate update ahead of the verb. Their lack of co-occurrence is immediately predicted. It is not the occurrence of these syncretic forms construed as indirect object with an accusative third person form which is problematic. Indeed, it is not the specific construals of these pronouns that provide the appropriate explanation for the oddity of the precluded forms. It is the fact that these forms, being syncretic, are associated with inducing only the building and decorating of some locally unfixed argument-relation, and so cannot co-occur with a dative or any other case-specification which is itself associated with inducing exactly the same weak tree relation.

It might be argued that this falls into the trap of identifying case underspecification with structural underspecification, equating gaps in a paradigm with syncretism. As pointed out by Adger and Harbour (2007), accounts which turn on case syncretism as reflecting relative weakness of specification are at best insufficient, since the same restriction is displayed in clitic systems with no syncretism in the clitic forms. In particular, this is displayed by Greek, with its distinct nominative/genitive forms for both first/second person subject and object marking:[21]

(36) *su me sistisan
2sg.gen 1sg.acc recommended.3pl
'They recommended me to you.'

Yet, as it turns out, such examples buttress the DS account, for they illustrate the one further type of tree growth that the DS system leads us to expect. So far, we have

[21] In Greek, the indirect object relation is expressed by genitive case. For a detailed account of PCC effects, see Chatzikyriakidis and Kempson (2011).

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itemised the induction of an unfixed argument node that is taken to give rise to immediate enrichment, the induction of a linked structure, and the building of sequences of locally unfixed nodes from an intermediate node. But we haven't had an instance analogous to the core mechanism underpinning long-distance dependency, which is the specification of case as decorating an unfixed node which does not induce immediate update. But this is the scenario provided by Greek. In these cases, the morphological specification for direct and indirect object arguments is distinct. If however, we assume that one of the options for tree growth that might get calcified is precisely such a non-constructive use of case, then we have the basis for analysing Greek, despite the lack of syncretism in first and second person clitic pronouns. All the clitic forms decorate an unfixed node, each with a filter on output encoding the appropriate constraint, with $?\langle\uparrow_0\rangle Ty(e \rightarrow t)$ for accusative, and some weaker specification for dative, dative being type-underspecified as between adjunct and argument construals and so of necessity underspecified as to tree position. This account of Greek clitic case specifications as frozen reflexes of case filters has the added bonus of completing the picture of possible calcification updates that clitic systems might reflect. So one type of problem isn't a problem for the analysis at all: to the contrary, it buttresses it.

4.2.2 The weak variant of the PCC

This explanation of the Person Case Constraint in terms of a structurally weak relation and no more than one unfixed node of the same typeat a time should, without doubt, carry over to anticipate equally that co-occurrence of first and second person pronouns should also be impossible, at least in a language such as Spanish in which the forms are syncretic. In many languages first and second person clitics are indeed mutually complementary, and indeed, as we would expect on the analysis just outlined, they are precluded in Greek:

(37) ***Mas** **se** edosan
1pl.gen 2sg.acc give.3pl.past
'They gave you to us.'

(38) ***Sas** **me** edosan
2sg.gen 1sg.acc give.3pl.past
'They gave me to you.'

Surprisingly, however, many cases are fully acceptable in Modern Spanish:

(39) No **te** **me** acerques
not you.refl me.dat come-closer
'Don't come closer to me.'

Examples like these might be taken to indicate that at least this subcase of the PCC is not grounded in a strong structural restriction, indeed is no more than a reflection of the fact that events describable by ditransitives in which both participants described are human are not common, and so didn't happen to lead to routinisations and encodings in the clitic clusterings that emerged (Haspelmath 2004). However, there is evidence that the stronger structural explanation is correct, simply obscured by the presence of polysemy of the relevant dative for some languages, specifically in Spanish (and Latin). It is certainly the case that in all languages, dative construals

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show a flexibility between an adjunct vs an argument form of construal, suggesting the necessity of saying that the dative is intrinsically underspecified for its logical type, and so must be associated with relatively weak structural specification, at least upon one analysis. Furthermore, in many languages, the apparently adjunct form of construal includes so-called ethical datives, in which the expression which is dative-marked may be only loosely linked with the predicate associated with the verb, characteristically associated with first and second person forms as utterance participants, implied to be indirectly affected by the event described by the verb plus its arguments. Spanish has very rich use of such datives, as did Latin before it, as in the Medieval Spanish examples below:

(15) Testimonias **me** sed oy
witnesses me.dat be.imp today
'Be witnesses on my behalf today.'

(40) y **te** **me** devuelvan vivo
and you.acc me.dat bring-back alive
'and may he bring you back to me alive' ('may he bring you back alive for my benefit')

(41) **Me** **le** gritaron a mi hijo
me.dat him.acc shout.3pl at my son
'They shouted at my son (and that affected me).'

Greek also has ethical datives:

(42) **mou** arostise to pedi.
1sg.gen was-ill the child
'The child was ill on me.' ('The child was sick and this concerned me.')

The question is whether such dative construals are sufficiently distinct to warrant a discrete lexical basis. Cuervo (2005), arguing for feature-geometry style of analysis, provides extensive evidence that in Spanish they do. Such ethical dative construals also occur in Greek, but the distribution of dative clitics is much more restricted than in Spanish:

(43) **mu** **ton** malosan to gio mu
1sg.gen 3sg.m.acc shouted-at the son mine
'They shouted at my son (and that affected me).'

As already noted, first and second person clitics never co-occur in Greek; and, in addition, no more than one dative clitic is ever possible (unlike the Medieval Spanish double dative example in (41)). Finally, in Spanish, under certain circumstances, more than two clitics may be possible, indeed sometimes with more than one dative clitic (data from Cuervo 2005, though acceptability judgements are very variable):[22]

[22] This is never possible in Greek, which has nothing analogous to these data.

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(44) **te** **nos** **lo** comiste
you.dat us.dat it.acc ate.2sg
'You ate it from us.'

(45) **te** **me** **le** llevé los casetes
2sg.dat 1sg.refl 3sg.dat took.1sg the tapes
'I took with me his tapes from you.'

(46) **me** **le** llevé el auto a Emilio
1sg.refl 3sg.dat took.1sg the car from Emilio
'I took with me/for myself Emilio's car.' ('I took Emilio's car')

(47) ? ¿en serio **te** **se** **lo** llevaste?
really 2sg.dat 3sg 3sg.acc took.2sg
'Really you took it from him for yourself?'

If we follow up on the Cuervo (2005) analysis within a DS perspective, we find a natural basis for distinguishing Spanish (under these variants) and Greek. On the one hand, the ethical dative as an adjunct construal can be analysed as inducing an independent LINK relation, so that all such dative instances would be decorating a node within a distinct tree, quite unlike the analysis of the dative that within an individual structure induces an unspecified tree relation. On this assumption, Spanish is seen as having evolved homonymous dative forms, the one initiating a transition onto a linked structure, the other inducing a weakly specified tree relation within a single structure. On this analysis we expect wellformed examples such as (39), despite the preclusion by the system of two unfixed nodes of a type at a time, since for all the apparent PCC violations, an alternative strategy is available in which only one unfixed node is constructed, the other clitic being taken to induce the construction of a fixed LINK relation, hence not in conflict with the tree-structural restriction. More generally, since all the dative clitics, first, second and third person, all allow ethical dative construals, on this account, we expect all combinations to be wellformed, even though not perhaps occurring often enough to have become a stored, routinized pairing.[23] Furthermore, as independently noted by van Hoecke (1996), ethical datives and argument-construal of datives merge seamlessly into one another, in particular for all first and second person clitic pronouns, since all first and second person specifications by definition constitute specification of the speech participants and their relation to the event described, so that there are grounds for positing an analysis in terms of a LINK transition for a dative pronoun without necessarily restricting the applicability of such a strategy to any particularly idiosyncratic non-argumental role.

[23] A further form of explanation for the rare cases of co-occurring first and second person clitics that can be observed in Medieval Spanish, as indicated by the scribal transcription of the pair of clitics in (i):

(i) Qui-**d** **nos** dio por alcalde?
who-you.acc us.dat gave.3sg as mayor?
'Who gave you to us as mayor?'

Notice the phonological cliticization of the second person on the *wh*-form, suggesting these are the result of an early step of *Adjunction feeding the building of clustered subject and object argument nodes associated with that first unfixed node. Under this derivation, the subsequent occurrence of *nos* will be able unproblematically to decorate a node locally unfixed with respect to the root, even though the ultimate position of the first cluster is itself not resolved until the verb is parsed.

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On this analysis, the challenge is to explain why a language such as Spanish can side-step the weaker variant of the PCC but not the stronger. This is straightforward. The stronger form of the PCC is a restriction on co-occurrence of first/second person pronouns construed as accusative and a third person dative construed as an indirect object, i.e. on how internal subcategorised arguments to a predicate can be realised by a clitic cluster. But with this limitation on the range of interpretations for both first/second person pronoun clitics and on the third person dative clitic, the type of construal for either of these clitics cannot be expressed through the alternative strategy of a LINK relation, for this is by definition external to the array of structure associated with a predicate plus its arguments. Hence the universality of the restriction, even applying in a language such as Spanish which allows *me/te* forms to co-occur.

This account of the potential for variability in the extent to which a language can sidestep the restriction underpinning the PCC resides in whether homonymy has emerged in the diachronic development of the language. This provides an immediate clue to the cross-language variation: we can see the languages in which both variants of the PCC hold as languages in which the ethical dative construal did not develop into any discrete homonymic form. In particular, one might argue, Greek presents such a case. In these more restricted languages, the dative clitic simply has the weakly specified form, inducing a structural relation that is compatible with a number of construals; but, with no alternative set of actions to induce, no first and second person clitics will ever co-occur, nor, more generally, will there ever be more than one dative clitic. So the language differentiation turns on whether, as in Spanish (at least in some dialects), the dative is polysemous between a characterization that induces a LINK transition in addition to the characterization that induces a weakly specified structural relations, or whether, as in Greek, the dative has merely a single specification. Hence the Person Case Constraint can be seen as grounded in a strong universally sustained restriction, with all apparent violations of the constraint explicable through the effects of variation in construal leading to the encoding of a distinct strategy. This account has the further advantage that one would expect exceptions only on a lexical basis, given the grounding of these exceptions in polysemy. With these set aside, the constraint holds absolutely: the gaps in the morphological paradigms in question arise because the individual sequence of actions to induce the precluded tree growth process could never have occurred, let alone have occurred often enough to have become routinised as a lexically triggered macro of actions.

5. The PCC in the larger perspective

With the PCC data seen as a mere consequence of a much more general structural constraint, the account can be evaluated by the potential applicability of this type of explanation. A structural constraint of this generality should be expected to have reflexes elsewhere in the grammar, acting as a constraint in quite different areas. Here we can do no more than signal the type of case one might expect, as indicative of the methodology of argument that this form of explanation leads to. Phenomena where, puzzlingly, only one type of relation is possible, despite apparent diversity in the structural effects, constitute a case in point. One such is a pattern in the verbal morphology of many Bantu languages, here illustrated with Otjiherero, spoken in Central and Northern Namibia and by a smaller group of speakers in Botswana. As in other Bantu languages, Otjiherero displays a complex prefixed sequence of subject, tense and object markings. These prefixes are very generally syncretic. For example, *vé* is a class two (human plural) marker which can be construed as either direct or

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indirect object.[24] These sequences are subject to some puzzling restrictions. One such restriction is in the object marking. Otjiherero agreement marking ranges freely over indirect object, direct object and locative-adjunct indications, yet despite the fact that their class-marking would serve to distinguish them, only one possible object marking is allowed, construed as either indirect or direct object or as locative:

(48) ú-térék-èr-à òvá-éndà ònyàmà p-òngàndà.
sm1-cook-appl-fv 2-guests 9.meat 16-9.house
'S/he cooks meat for the guests at home.'

(49) ú-vé-térék-èr-à ònyámà p-òngàndà
sm1-om2-cook-appl-fv 9.meat 16-9.house
'S/he cooks them meat at home.'

(50) ú-í-térék-èr-à òvá-éndà p-òngàndà
sm1-om9-cook-appl-fv 2-guests 16-9.house
'S/he cooks it for the guests at the house.'

(51) ú-pé-térék-èr-à òvá-éndà ònyàmà.
sm1-om16-cook-appl-fv 2-guests 9.meat
'S/he cooks meat for the guests there.'

Trying to use two object markers leads to ungrammaticality:

(52) *ú-vé-í-térék-èr-à p-òngàndà
sm1-om2-om9-cook-appl-fv 16-9.house
'S/he cooks it (for) them at the house.'

(53) *ú-í-vé-térék-èr-à p-òngàndà
sm1-om9-om2-cook-appl-fv 16-9.house
'S/he cooks it (for) them at the house.'

There are thus grounds to warrant the hypothesis that this entirely distinct Bantu-internal morphological problem is subject to explanation in terms of the very same constraint as the Person Case Constraint. An analysis along these lines is developed in Marten et al. (2008), relating the restriction in Otjiherero of one object marker in the verbal cluster, and the absence of object marking in passives, to the same constraint of having only one unfixed node of the same type at a time. Furthermore, variation in object marking across different Bantu languages (see e.g. Marten and Kula 2012 for an overview) is in many respects reminiscent of variation encountered in Romance (e.g. Cocchi 2001, Labelle 2008), and thus might be explicable in similar terms to the analysis presented here. Another piece of evidence comes from the same language group but from a very different domain – in the Tanzanian Bantu language Rangi,

[24] The numbers in the glosses indicate the class-marking, e.g. om2 indicates object marking of class 2 (construed as a set of people). In fact, *vé* can also serve as a class 2 subject marker denoting human plural, relying on the immediately following morpheme to disambiguate it as subject-marking, so the syncretism may be across all possible argument construals:
(i) vé-mún-á òvi-kùryá
sm2-see-fv 8-food
'They see food.'

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future tense is regularly marked by fronting of an infinitival verb form and a following inflected auxiliary. In the analysis explored in Gibson (2013), this reflects the development of an unfixed node which is decorated with information from the infinitive, and which is fixed when information from the auxiliary provides fixed tree structure, with the subject marker decorating a locally unfixed node. Interestingly, when another element decorating an unfixed node is present in the clause – such as a *wh*-expression, a negation marker or a focused NP – the infinitive follows the auxiliary, even though the future tense interpretation is maintained. In DS terms, this follows from the restriction on only one unfixed node at the time, explored in detail in the preceding sections.

6. Conclusions

The explanation of the complexity of clitic clustering presented in this paper competes on the one hand with accounts which have been taken to justify the specification of morphological templates within some syntax-independent morphology component, and on the other hand with accounts of such clusters in terms of feature-geometry which are at best only a trigger for structural processes and are not intrinsic to the structural processes themselves. Relative to these, the present perspective suggests a much stronger and more restrictive alternative – that morphosyntactic phenomena, like syntactic processes more generally, can be explained solely in terms of the dynamics of the ongoing process of building up interpretation, with morphosyntactic particularities displaying frozen reflexes of these general structure building processes. Whether this novel perspective on morphosyntax and syntax can be sustained as a general hypothesis might be seen as remaining an open question, but the competitiveness of the present account of the PCC against current alternatives gives grounds for optimism.

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