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The duality of syntax: unstable structures, labelling and linearisation.[1]

Abstract: this work aims to enhance the theory of Dynamic Asymmetry by including symmetric head-head structures, the inevitable first step of any derivation (the "ignition" problem). The symmetry-breaking "repair" options available give rise to basic head-initial and head-final word orders. One of the consequences of this approach is that all word-order parameters reduce to head movement options. We take this to be a conceptual advance for the theory of word order variation. This approach and the empirical data discussed here also provide us with a unique opportunity to consider the role of labelling and linearization in the architecture of universal grammar.

0. Introduction.

There is tension in modern formal linguistics between the overwhelming evidence of asymmetry in syntax (Kayne 1994, 2013: 224f., Haider 2013: 2, Sheehan, Biberauer, Holmberg & Roberts 2017, among others) and the fact that the simplest formulation of the fundamental compositional operation (Merge) generates symmetrical structures (Moro 1997, 2000, 2019, Chomsky 2008, 2012, 2013, 2015, Rizzi 2013, 2015, 2016, Citko 2005, 2008a, 2008b, 2011 among others). Dynamic Antisymmetry (Moro 1997, 2000, 2009) is intended to resolve this tension by postulating that movement intervenes to restore asymmetry as required by specific interface conditions. In this paper, we would like to extend the Dynamic Antisymmetry approach, which was originally applied essentially to XP-XP symmetries, to head-head symmetries and explore some of the consequences of making this move. We propose that, just as Dynamic Antisymmetry has made it possible to derive certain "EPP stipulations" (i.e. to eliminate the need to stipulate EPP features on certain positions in order to trigger XP-movement, notably concerning subject positions in non-null-subject languages) and explain other core properties of syntax (see the list in section 2), extending the idea to head-head symmetric structures allows us to eliminate further such stipulations: for example, this regards Massam's (2001) analysis of VOS orders and the trigger for the roll-up movement which derives head-final orders under the assumptions of Kayne (1994), effectively an EPP stipulation in Biberauer, Holmberg & Roberts (2014). Head-head symmetry is found at the inevitable first step of any derivation, called "ignition"; we propose to derive basic head-initial

[1] Earlier versions of this paper were presented at *Linearise Constituents Across Domains* Congress at the "Bled Institute · Blejski inštitut" in Bled Slovenia in 2020, at 46th *Incontro di Grammatica Generativa* at the University of Siena in 2021, at *Syntax Lab* at Cambridge University in 2021, at the *Seminars in Linguistics* at the University of Florence in 2022, in *SynSalon* at the University of Arizona in 2021.We are grateful to the audiences at these presentations for many insightful comments and questions as well as to two anonymous reviewers and to the very generous attention of Hedde Zeijlstra for detailed comment and criticism while managing the submission of this paper. All errors remain each other's responsibility.

and head-final typologies from the "repair" options predicted by Dynamic Antisymmetry. We also find a general trigger for smuggling (see Belletti & Collins 2021).

The question arises as to what the mechanism behind Dynamic Antisymmetry is. In Moro (1997, 2000) it was considered to be related to the requirements imposed by the PF interface, namely linearization (explaining the obligatory deletion of the phonological features of the lower copy). On the other hand, in Moro (2009) and Chomsky (2008:11, fn. 30, Chomsky 2012:66, Chomsky 2013:11, Chomsky 2015:102) Dynamic Antisymmetry was thought to be related to computational requirements imposed by the need for labelling at the semantic interface. In what follows, we will see that both linearization and labelling function as triggers for the repair mechanisms underlying movement.

1. Symmetric Merge.

The initial formulation of Merge in (Chomsky 1995: 243-249) is given in (1):

(1) Merge (X, Y) = {K, {X, Y}}, where K = label of the category formed by merging X and Y.

This was designed to be an inherently asymmetrical operation, namely one where either element merged, X and Y, projected the label K of the resulting constituent. Synthesising, Merge takes two syntactic objects α and β, and generates K with a label γ. The label yielded by this strictly derivational operation is "determined uniquely for α and β in a language L, meaning that only one choice yields an admissible convergent derivation" (Chomsky 1995: 244). Crucially, the only requirement was that γ must be construed from the features constituting α and β without introducing new information. The first version of Merge came out as a choice among three logical possibilities, assuming that every merge must receive a label upon merger. In fact, in the original first version of Merge, the principle according to which Merge must not introduce new information led to the possibility that γ be one of the following:

(2) a the intersection of α and β
b the union of α and β
c one or the other of α and β

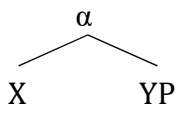
The only admissible option is (2)c: the other two options are "immediately excluded: the intersection of α and β will generally be irrelevant to output conditions, often null: and the union will be not only irrelevant but 'contradictory' if α and β differ in value for some feature, the normal case." (Chomsky 1995: 244). Asymmetry was in a sense built in as a restriction on the output of Merge. In Kayne's (1994) theory of the antisymmetry of syntax, on the other hand, symmetry is banned from syntax for a different reason, namely linearization: in Kayne's system precedence and (local) asymmetrical c-command are one and the same linear ordering relation as assumed in the Linear Correspondence Axiom (LCA). In other words, for a word W to precede a word W' there must be a non-terminal node X dominating a terminal node W which asymmetrically c-commands a node Y dominating a terminal node W' and for every node X asymmetrically c-commanding a node Y there must be a terminal node W dominated by X preceding a terminal node W'. For different reasons, both for Chomsky and Kayne, symmetry is to be banned from syntax.

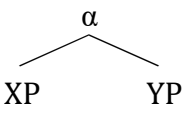
Moro (1997b, 2000) proposed an alternative view which included the possibility of a symmetrical output by Merge within the theory named "Dynamic Antisymmetry" (DA). Notably, this version was compatible with the basic tenets of Merge in that Merge does not

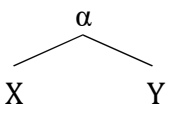
include new information or any intersection in the derivation. This proposal was adopted in Chomsky (see the above citations) arriving at a maximally simple reformulation of Merge, which amounts to adding an option to (2) including the possibility that Merge generates an unlabelled structure. This led to the following comprehensive version of Merge:

(3) Merge (X, Y) = {X, Y}, for any $X^{max/min}$, $Y^{max/min}$.

Since X and Y must be either maximal or minimal (i.e. they either result from a prior operation of Merge or they don't), prior to linearization the output of (3) can be visualised as one of the structures in (4) or their mirror notational variants. Here (4b) and (4c) are "Points of Symmetry" (POS):[2]

(4)a. 

b. 

c. 

In Moro's (1997, 2000) DA approach, Universal Grammar appears to be more parsimonious in that it avoids the *ad hoc* restriction banning symmetrical configurations (see Zwart 2011 and Zeijlstra 2022 for historical and critical reflection on symmetry and Merge). Moreover, DA has the advantage of linking movement to the geometry of phrase structure: for any symmetrical structure, grammar is forced to make a copy of the offending element in a non-symmetrical position and delete the phonological features of the lower copy thus eliminating the problem related to linearization. This proposal also explains why movement affects the phonological interface which would otherwise be an *ad hoc* requirement. The latter claim is also supported by the possibility of tolerating symmetrical structures when inherently phonologically null categories such as *pro* are merged (see Moro 1997b analysis of inverse copular sentence rightward agreement in Italian). On the other hand, in a later work (Moro 2009), it was suggested that symmetry could instead be interpreted as the cause of a failure in the assignment of a label to the constituent generated by merging two projections of the same level; notably, this alternative interpretation of DA was in fact independently suggested in Chomsky (2008:11).

Crucially, there has been no definitive empirical nor theoretical reason to assume that either interpretation of DA (the one based on linearization vs. the one based on labelling) is to be excluded. Accordingly, we will rather assume that, in order to be legible at the two virtually necessary interfaces, namely PF and CI, a structure must meet two distinct conditions of stability. Formally, a structure Σ is stable iff both conditions are satisfied: (i) Σ is linearisable at PF: it must be LCA-compliant/legible so that the terminals can meet the requirements for a locally total linear ordering; (ii) Σ is labellable throughout the derivation: without labels, syntactic objects cannot be "seen" by the operations of the system (including Merge) in particular the CI interface.

Of the three structures in (4), only (4a) (leaving aside the possible linearizations of these three trees) meets these requirements. Let us call (4b,c) "Points of Symmetry" (POS). Here we will explore how POSs are repaired, and what the consequences of that repair mechanism are.

The core proposal of Dynamic Antisymmetry is that whenever a POS is generated, movement intervenes to rescue it. Three major theoretical differences characterise DA in comparison with standard feature-driven approaches to movement:

[2] Here we follow Chomsky (2013) in using the symbol α as a placeholder to refer to a syntactic object which is yet to be labelled.

(5)i The trigger for movement is not based on feature-checking, valuation, agreement, etc..[3]

ii The trigger for movement is "reversed": movement is as a *push-chain* phenomenon rather than a *pull-chain* phenomenon.[4]

iii *Ad hoc* restrictions on Merge, such as the prohibition of merging two categories of the same type, i.e. two heads or two phrases, are avoided, rendering grammar more parsimonious.

A comprehensive DA based analysis of movement has not been provided yet but paradigmatic samples of POSs have been found in syntax in a comparative perspective.[5] More specifically. POS of the XP-XP type have received much more attention than X-X ones. In this paper, we will concentrate on the latter, but first we summarise the results already obtained for the former in section 2.

2. Symmetric XP-XP structures: a summary.

The first type of symmetric structure is given in (3)b, reproduced here as (6)a. This case of symmetry has been extensively analysed since Moro (1997b, 2000) from both a theoretical and empirical point of view and will only be sketched out here.

Formally, the existence of POS of the type XP-XP admits two potential repair strategies, namely (3)b and (3)c:

(6) a. * [XP YP]
b. XP … [~~XP~~ YP] (repair strategy I)
c. YP … [XP ~~YP~~] (repair strategy II)

In other words, for any given POS resulting by merging two maximal projections, movement of either XP simultaneously solves both the LCA and the LA related problems: first, because deletion of phonological features of the lower copy makes it invisible by definition to linearization; second, because labels cannot be provided by discontinuous constituents (Moro 2009, Chomsky 2013, 2015) and thus the unmoved element is free to project, eliminating ambiguities. Of course, morphological restrictions on the landing site may intervene selecting which option is viable (see Note 3). Notice that DA offers an independent reason as to why the

[3] Saying that movement is triggered by the necessity to rescue symmetrical unstable strutures does not imply at all that morphology doesn't play a role in movement: in fact, it does as a filter on possible landing sites. For example, from a small clause of the type [DP DP] as a complement of the copula either DP can be raised to SpecTP; on the other hand, from a small clause of the type [DP AP] only the DP can be moved rescuing the unstable structure (see Moro 2000 for a detailed analysis and Di Sciullo 2005; see also Moro 2019 for the role of morphology in predication); this is a reflex of the fact that only DPs can appear in SpecTP, presumably due to the phi-agreement property of T. Notice also that morphology plays a very different role when it comes to movement of a full phrase or a head: head movement will be the core topic of the next section but it is important to bear this in mind here. We are grateful to an anonymous reviewer for pointing this out.

[4] We are borrowing the term "pull chain" and "push chain" from structuralism following the suggestion of Henk van Riemsdijk (p.c.). The original terms *chaîne de traction* and *chaîne de propulsion* were introduced by André Martinet to explain phonological change such as that characterising phenomena like the English Great Vowel Shift (see for example, Martinet 1955). We do not import any teleological flavour within our system: movement is still to be considered a blind operation.

[5] Summarising for the sake of clarity, DA was first formulated as a failure of linearization in Moro (1997, 2000); it was then proposed that DA could be interpreted as a failure of labelling in Moro (2009) and independently in Chomsky (2008).

phonological features of the lower copies of a chain must be deleted (for an extensive discussion see Moro 1997, 2000).

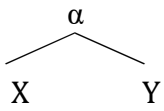
This theoretical approach and the correlated analysis have been successfully applied to different empirical domains both at the clausal and non-clausal level. These include, among other case studies: canonical and inverse copular sentences (Moro 2000, 2009, Londhal 2006, Pereltsvaig 2007), EPP like effects and locality issues such as criterial freezing (Rizzi 2013, 2015, 2016, Shlonsky & Rizzi 2018, Citko 2005, 2008a, 2008b, 2011), *that*-trace effects and phase impenetrability condition (Abe 2016), existential sentences (Moro 1997, 2000, Kayne 2019), quasi-copular sentences (Moro 1997, 2000), unaccusative constructions (Moro 1997, Hale & Keyser 2002), numerals (Kayne & Moro 2022), causative constructions (Guasti et al. 2001, Belletti 2017), clausal predication (Moro 2019), phrase structure (Zwart 2011), DP internal inverse predication in English and Romance languages (Barrie 2006, 2011a, 2011b, Den Dikken, 1997, 2004, Kayne 1994, Moro 2000, Zamparelli 2000) and Sanskrit (Mocci & Pontillo 2019), *was-für* split constructions in German (Ott 2009, 2012, 2015) and their equivalents in Romance languages (Moro 2000), word-formation (Di Sciullo 2005), wh-movement and sluicing (Richards 2010), (multiple) *wh-in-situ* constructions (Moro 2011) among others.

The approach based on DA also allows us to rethink rather murky theoretical issues such as those related to EPP phenomena and clausal predication in general (see Moro 2019 and references cited there). The obligatory DP raising in copular sentences in pro-drop language like Italian, in fact, shows that movement is a push-chain phenomenon rather than a pull-chain one as was assumed in EPP-based approaches. This, in turn, has suggested new analyses of other clausal phenomena, such as those related to word-order typology which will be considered in section 3 of this paper. Moreover, it allows us to explain VOS order in a natural way by assuming that the POS can be solved by moving VP to spec-TP position, provided that morphological restrictions on the landing site are compatible (Moro 2004) much in the same sense as in causative sentences proposed in Guasti & Moro (2001); see also Belletti (2017) for an independent converging analysis. We will look at some of these points in more detail in the next two sections.

3. Symmetric X-X structures: ignition, harmony and typological consequences.

In this section we look at the other principal type of POS, namely the unstable head-head structures. Consider again (4c):

(4c)



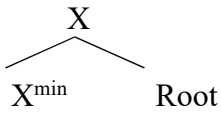
In this structure X and Y cannot be linearised. This is the well-known "bottom-pair" problem, recognised as arising from the combination of the LCA and bare phrase structure since Chomsky (1994). Nor, as it stands, can the structure be labelled (assuming X and Y are distinct categories, i.e. they do not have the same formal features; see below). This structure is therefore inherently unstable and will cause the derivation to crash at the interfaces.

As recognised by Chomsky (1994), this is a serious problem (see also Chomsky 1995: 334-8 and Kayne 2008). If only minimal syntactic elements with no internal structure are accessible to External Merge, then (4c) must be the first step of any and every derivation; hence we refer to it as the Ignition Problem. Note that the Ignition Problem arises before any arguments are merged. If we depart from the assumption that only minimal categories can be

externally merged, then we are implicitly allowing narrow-syntactic operations, i.e. Merge of some kind, into either the Lexicon or the Numeration (or both). This is clearly an undesirable move, which in any case may only displace the problem.

One solution to the problem posed by (4c) was first put forward in a different context by Marantz (1997), and adopted in the context of labelling theory by Chomsky (2013: 47). This is the idea that one of X and Y, say Y, has no categorial feature. In other words, Y is a Root, and X is a categoriser. In these terms, (4c) becomes (7):

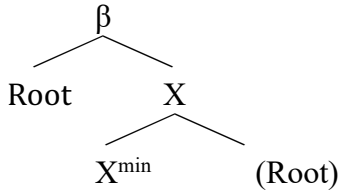
(7)



The structure now clearly has a label, X. Nonetheless linearization is still not possible since the lowest occurrence of X, namely X^{min}, and Root mutually c-command; hence, even in languages where X-Root or Root-X appears to be the order of morphemes in category-plus-root structure (and of course there are many languages that depart from this simple pattern, e.g. the Semitic languages), the structure cannot be (7) as this structure is too symmetrical.[6] By parity of reasoning with our discussion of (4b) in the previous section, one of X^{min} and Root must move. Let us discuss each movement option in turn.

The first option we consider is that of moving Y, the Root. This gives rise to the derived structure in (8):[7]

(8)



In this structure α of (4c) is successfully labelled X and the Root (Y) can be linearised as preceding X^{min} since it now asymmetrically c-commands X^{min} (recall that we assume, as is standard in antisymmetric approaches to linearization, that silent copies do not count for the computation of linear order hence the copy of the Root is no longer relevant for linearization

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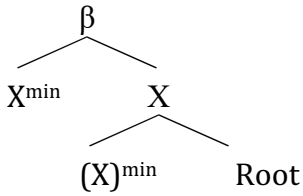
[6] Here we are assuming the standard definition of c-command from Reinhart (1983):
(i) α c-commands β if and only if the first branching node γ dominating α dominates β.
By this definition, the lower occurrence of X and Root clearly c-command one another. For asymmetric c-command to obtain, one of α or β must have internal structure, but that is not case here by assumption: we are dealing with externally merged elements. Given Kayne's (1994: 16) category-based definition of c-command neither X nor Root asymmetrically c-commands the other and so the structure is equally unlinearisable. Kayne's definition of c-command runs as follows:
(ii) X c-commands Y iff X and Y are categories and every category that dominates X dominates Y.
In (4c), as given, no category dominates either X^{min} or Root; moreover, X^{min} is not a category, but a segment, and Root is not a category as it has no categorial features. Alternatively, since Kayne's definition of c-command is based on the distinction between segments and categories, we could postulate that this distinction does not apply to heads. In that case, once again the structure in (7) would be unlinearizable since the lower copy of X would symmetrically c-command Root. See also Note 8.

[7] A reviewer points out that movement of the Root may be incompatible with the idea that Roots are not syntactic objects. Following what we take to be the standard view in Bare Phrase Structure, we assume Roots are syntactic objects, since they are visible to Merge; however, they are inert for many syntactic operations since they lack formal features.

after movement). Furthermore, β must be labelled X as Root has no categorial feature.[8] In this structure, the lowest occurrence of X in (8) is defined as X^{min}, the head of β, with β defined as X^{max}. Y, the Root, is the complement of X^{min}. We see then that the complement has moved around the head, so (8) is then effectively a case of rollup of the kind defined by Biberauer, Holmberg & Roberts (2014): movement of the complement around the head within the maximal projection of that head.[9] The first repair option of (4c), then, effectively yields a head-final structure.

The second option for repairing (4c) involves moving X, i.e. X^{min}. This gives rise to the derived structure in (9):

(9)



Here, as in (8), X will again label β. Unlike in (8), however, the moved X asymmetrically c-commands the Root Y. Hence, by the LCA, X is linearised as preceding the Root. Since it is X^{min} that moves, this is a case of head-movement. It therefore gives rise to head-initial order.[10] This kind of structure is sometimes referred to as "reprojection" (Bury 2003, Donati 2006), but in terms of the proposals being made here it is a canonical case of head-movement; "reprojection" is a consequence of labelling as just described.

We see then that the possible repairs of (4c) give rise either to rollup (8), and hence head-final order, or to head-movement (9), and hence head-initial order.[11] This naturally leads us to consider these two options as a parameter. We can state the parameter as follows:

(10) **The second-Merge parameter:**
Repair the unstable structure in (4c) **either** with:
Move X (= head-movement, giving head-initial structure/order), **or** with:

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8 Here we must assume Reinhart's notion of c-command rather than Kayne's (see note 6). If not, by Kayne's definition of c-command here, with β=X, Y=Root does not c-command X and so linearization becomes impossible. This problem does not arise, however, if we adopt the suggestion in note 6 that the segment-copy distinction does not hold for heads. In order to prevent the intermediate X c-commanding Root, giving an ordering paradox, we would have to add the specification "every category distinct from X that dominates X dominates Y" to Kayne's definition in note 6.

9 Since we assume that movement is not driven by feature-checking, Abels' (2003) argument against this kind of movement dissolves. This conclusion does not imply that there is no anti-locality constraint; it implies that complement-to-specifier movement is not necessarily too local (essentially stipulated by Biberauer, Holmberg & Roberts 2014) and that feature-driven anti-locality is not relevant to cases of movement not driven by features, which is what we are concerned with here.

10 A reviewer points out that if the Root Y has categorial features, then movement of Y will result as head-movement since Y will then label β (this being a derived head-complement structure, with the non-minimal projection of X the complement of the moved Y). So Y-movement gives rise to a head-initial structure. This is not rollup since X^{min} is not the head of the derived category, only when the acategorial Root raises do we have this result. The reviewer is correct to point this out, but it doesn't alter the point that head-movement and Root-movement give rise to the different outcomes we describe.

11 For non-root cases of (4c), see the discussion in Moro (2000: 84-92) and references given there. In a nutshell, the cases considered there include clitics. One interesting case for example is the "locative clitic" *lì* (there) which involves movement. Italian dialects offer both possibilities to solve the POS: in northern Italian dialects such as Pavese (Lombardy) we have *lì lü* (there he; "he" with a strong deictic force as in "that person over there") whereas in Massa (Tuscany) we have the opposite type *lu lì* (he there; "he" with the same deictic interpretation).

Move Y (= roll-up, giving head-final structure/order).

Let us now adopt the "emergentist" approach to parametric variation (see Roberts 2012, 2019), whose central idea is that parametric variation arises from the interaction of the three factors of language design of Chomsky (2005). According to this approach, parametric variation emerges from the interaction of a radically underspecified UG (first factor), the learner's characteristic mode of interaction with Primary Linguistic Data (second factor) and, most relevant here, language-independent optimisation conditions of various kinds (third factors). The third factor relevant here is Input Generalisation. The intuition behind this idea is that as acquirers move from one state S_n of language acquisition to the next state S_{n+1}, they will, all things being equal, exploit the devices already postulated for state S_n in their grammar to maximal effect: the opposite would be arguably cognitively costly. Like the subset principle, this intuition aims at capturing the fact that the acquirer prefers to minimize the computational burden on the processes of acquisition. If acquisition of parameter settings consists in recognising the presence and operation of certain formal features (FFs) in the target grammar, then Input Generalisation can be formulated in terms of feature-maximisation (see Roberts 2007: 275).

However, the second-Merge parameter as formulated in (10) does not make reference to FFs, consistent with (5i) above. We therefore need to reformulate Input Generalisation in terms of operations, the intuition being that in an optimal system operations are maximally generalised. We therefore tentatively replace the earlier conception of the Input Generalisation shifting from a feature-based to a DA-based approach:[12]

(11) Input Generalisation: maximise repair strategies.

The result of (11) is that the operation chosen to repair the ignition problem, i.e. Move X or Move Y, head-movement or complement-movement (rollup) will maximally iterate.

The maximal iteration of Move Y will cause roll-up to iterate as the structure is built. This will give rise to fully harmonic[13] head-finality. On the other hand, the maximal iteration of Move X will give rise to fully harmonic head-initiality. Since Input Generalisation only expresses a preference, it is defeasible, therefore Move X and Move Y can in principle "flip" at any stage of the derivation; this is what gives rise to the possibility of disharmonic orders.[14]

A possible typological consequence of the parameter in (10) combined with Input Generalisation is that head-movement systems have more complex heads. Hence we may

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12 The question arises as to how far we can replace feature-driven movement with DA-driven movement. This is not the place to develop a general theory of movement, but we see this prospect as a desirable outcome of the current proposals. For a DA-driven account of wh-movement, see Moro (2000:49-61) and the extended discussion of this account for *was-für* split constructions in Ott (2015).

13 By "harmonic" we mean that all head-complement pairs show the same linear order, regardless of category. This is essentially the sense of word-order harmony that originates in Greenberg (1963) and is formulated in terms of heads and complements in Hawkins (1983).

14 In principle, the "flip" from Move X to Move Y or vice versa is free. This means that the disharmonic orders that arise can be either head-final over head-initial or head-initial over head-final. However, the Final-Over-Final Condition of Sheehan, Biberauer, Holmberg & Roberts (2017) rules out the former option. FOFC can be informally stated as follows:

A head-final phrase XP cannot immediately dominate a head-initial phrase YP (in a given local domain).

FOFC itself does not follow from the mechanisms under consideration here; the proposals here are entirely independent of this generalisation and whatever it may follow from (see Biberauer, Holmberg & Roberts 2014, Sheehan, Biberauer, Holmberg & Roberts 2017, Erlewine 2017, Roberts 2019:161 and Zeijlstra 2022 for different proposals in this regard). Moreover, if FOFC turns out to be incorrect (more precisely, if it emerges that it is really just a tendency with exceptions), this would not alter the proposals being made here.

expect relatively rich visible functional structure in systems which take the head-movement option in (10), i.e. head-initial systems. It has been observed that head-final languages tend to lack determiners (Sheehan 2013), that head-final relatives are always non-finite and lack relative pronouns (Hawkins 2004, Kayne 1994, Cinque 2023), etc. Furthermore, Ledgeway (2012: 242) argues that there were parallel changes in CP and PP between Early and Classical/Late Latin and Romance which involved the loss of final, silent probes and their replacement by initial, overt probe[15]. The archaic structures are shown in (12):

(12) a. Pompeius [. . .] profiscitur [$_{PP}$ [Canusium] [Ø]$_{P}$]
Pompey. sets-out Canusium.
'Pompey . . . sets out for Canusium.'
(Ledgeway 2012: 241 ; Caesar *De Bello Gallico* 1.24.1)

b. [$_{CP}$ [$_{TP}$ tacitum te dicere] [Ø]$_{C}$] credo.
silent you say I.believe
'I fancy you say to yourself ' (Ledgeway 2012: 240 ; Martial 6.5.3)

These were replaced by constructions with overt initial Ps and Cs as shown in (13):

(13) a. miles [$_{PP}$ ad [Capuam]] profectus sum
soldier to Capua set-out I.am
'I set out as a soldier for Capua.'
(Ledgeway 2012: 241; Cicero, *De senectute* 10)

b. Scis quod epulum dedi.
know-2sg QUOD meal-ACC gave-1sg
'You know that I gave a meal.'
(Petronius 71, 9; Ernout and Thomas 1993:299)

Ledgeway relates these changes to the more general shift from primarily head-final order in Early Latin to primarily head-initial order in Romance. Following Roberts (2021a:193), we can summarise this development as follows:

(14) a. [$_{XP}$ [.. DP/TP$_{Goal}$ ..] [$_{Probe}$ [Ø]$_{C/P}$]]
b. [$_{XP}$ [$_{Probe}$ [*quod*]$_{C}$/[*ad*]$_{P}$] [… DP/TP$_{Goal}$ …]]

In terms of (10), however, we could reformulate (14a) as rollup movement over a silent head, while (14b) represents the head-movement option. The changes observed by Ledgeway are hence changes in the value of (10), and we expect the emergence of overt initial probes as a system shifts from the Move Y option to the Move X option. This could be a facet of parameter-expression (in the sense of Clark & Roberts 1993): the head X will tend to be overt in a Move-X system. There is also a natural connection to head- vs dependent-marking in the sense of Nichols (1986, 1992), with head-marking reflecting the head-movement option and dependent-marking the roll-up option. Dependent marking and head-final orders are connected, as has

[15] We formulate the discussion here in terms of probes and goals since we are reporting the earlier discussions of Ledgeway and Roberts, which were formulated in those terms. Given (5i), we do not regard probe-goal relations as movement triggers (which would entail a further "EPP stipulation", contra a DA approach). But this does not mean that probe-goal Agree does not exist at all, a point on which we remain neutral here.

often been observed in the typological literature (Nichols 1986: 79f., 1992: 105f, Tables 21-24; Song 2014: 200).

In this section, we have seen how the repair strategies for the unstable structure in (4c) represent the parametric options in (10), which relate directly to cross-linguistic word-order variation and possibly other properties.

4. On symmetrical Merge and some possible consequences.

In this section we generalise our notion of point of symmetry and, rather speculatively, consider some further possible typological implications of our approach.

4.1. Deriving the necessity of Internal Merge.

Informally, we assume that whenever Merge combines two syntactic objects of the same syntactic complexity, thus constituting a point of symmetry; grammar contains an instruction forging Merge of either object to a non-symmetrical position to solve the instability.[16] From a more formal point of view, the following formula holds:

(15) For all X, Y where X and Y share the same value of [minimal] and [maximal] (i.e. where both are heads or both are XPs):

Merge {X, Y} → Z => Merge {X, Z} or Merge {Y, Z}

This amounts to saying that Internal Merge is a necessary operation in the system. Note that since Chomsky (2004) it has been pointed out that special stipulation would be required to exclude Internal Merge, but now we see that the system actually cannot function without it: Internal Merge is the automatic consequence of the non-computability of symmetric structures generated by External Merge. Hence Internal Merge is not only possible but in fact necessary as a consequence of the existence of External Merge.

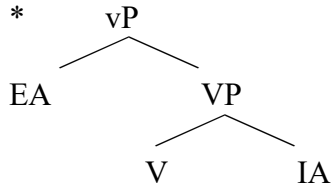
Where both X and Y are maximal, we have (4b), the unstable structure where two XPs are sisters, discussed in Section 2. Where X and Y are minimal, we have the head-head structure, discussed in Section 3. It is also possible for both X and Y to be both maximal and minimal: this would be a clitic cluster, on the assumption that clitics are both maximal and minimal categories (Muysken 1982, Chomsky 1995, Roberts 2010, among others). We thus derive a result parallel to that in Kayne (1994: 19-20): fully symmetric syntactic clitic clusters are impossible. For Kayne, this follows from his category-based definition of c-command (see Notes 4 and 6); we are able to derive it as a case of DA.

4.2 Typological consequences of symmetrical Merge.

[16] As for a comprehensive taxonomy of syntactic objects and the possibility to derive them from more abstract features see Moro (2018) and references cited there. The idea is that syntactic objects can be generated by combining two opposite values: +/- atomic vs. +/- encapsulated, where "+ atomic element" means that no part of the element can be targeted by Internal Merge and "+ encapsulable element" means that it can be merged to an XP without projecting (the -values obviously represent the opposite). The systematic combination of these values generates a matrix where: - atomic, + encapsulable are XPs; + atomic, - encapsulable are X°; - atomic, - encapsulable are Bare Small Clauses, namely XP XP constructions; finally, + atomic, + encapsulable are expletives, such as *there*.

Our approach replicates a basic result of Chomsky (2013, 2015) to the effect that movement out of vP must take place. This is one case of Alexiadou & Anagnostopoulou's (2001, 2006) "*in-situ* generalization," formally:[17]

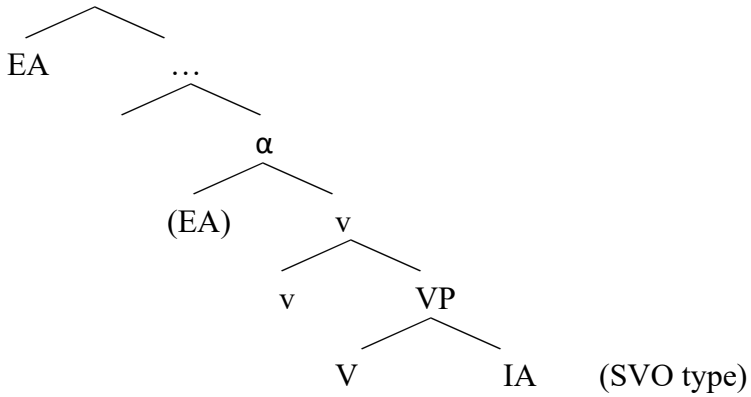
(16) *



In other words, something must always move out of vP. This is clearly an instance of (4b). Chomsky's (2013, 2015) proposal that the structure is repaired by moving the EA to SpecTP is clearly fully consistent both with Alexiadou & Anagnostopoulou's generalization and with the general approach here. But there is also a potential typological consequence, in that (15) may also be relevant for Mahajan's Generalisation (see Mahajan 1994, Taraldsen 2017): there are no SVO ergative languages (see Taraldsen 2017 and Roberts 2020b for documentation of this). If an ergative-marked EA is frozen *in situ* in Spec,vP by whatever mechanism Case-licenses it (see the papers in Coon, Massam and Travis 2017 for a range of proposals along these lines), then, even if the *in-situ* IA is able to access some special means of Case-licensing (e.g. a "low Absolutive" of some kind), (16) will result. But this structure features an unresolved point of symmetry and so cannot survive to the interfaces. If the EA raises, then, by assumption, it is not ergative but nominative.

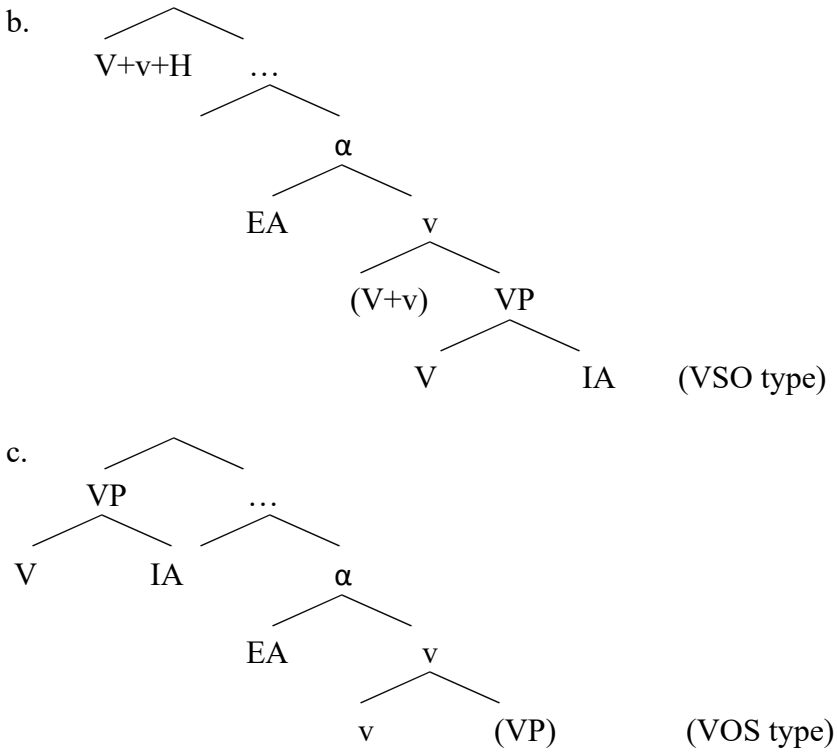
The DA approach adopted here leads us to contemplate other possible derivational options. Consider the structures in (17):

(17) a.



(SVO type)

[17] An anonymous reviewer points out that a version of this generalization, and a possible associated POS, may arise in Cinque's (2005) account of Greenberg's Universal 20. This may be correct, but a full consideration of Universal 20 and Cinque's important generalization that any category moving within DP must contain the lexical N would go beyond the aims of this short paper. See Cinque (2013) for an extension of this generalization to movements within the clause. We hope to address these questions in future work.



(17a) corresponds to the repaired version of (16); this is the typical structure in SVO languages (which, as we have just seen, cannot feature ergative alignment). The unlabelled category α receives the label vP, as proposed in Chomsky (2013, 2015). Here V-movement is also an option, as has been well known since Pollock (1989). In fact, if the IA has no internal structure V-movement would be required, given the discussion in Section 3.

(17b) corresponds to VSO order, or, more precisely to VSO order arising in languages where the EA does not raise out of vP. Following earlier proposals by Carnie & Guilfoyle (2000), Roberts (2019: 383-98) suggests that there are two kinds of VSO languages, distinguished largely in terms of the surface position of the EA. One type raises the EA, and so has the structure in (17a), but with V-movement to a higher position in the TP field than that occupied by the EA; this is what we find in the Celtic and Semitic VSO languages. The other type instantiates (17b) in that the verb raises (perhaps, at least in some languages, to a fairly low position in the TP field) and the EA does not move. This is the situation in various Austronesian and Mayan languages (see for example Massam 2001 on Niuean, and Coon 2013 on Chol). In these languages, the *in-situ* generalisation is satisfied by V/v-movement, suggesting that Alexiadou & Anagnostopoulou's reduction of it to Case-licensing is probably not correct. Taking verb-movement to be a consequence of the head-movement option in (10), the proposals in Section 3 predict that such languages will be head-initial and head-marking in Nichols' sense, which is basically correct.

However, just raising v/V out of vP as in (17b) leaves the point of symmetry between EA and vP untouched since we still have two non-minimal categorially distinct sisters. This means that when v/V raises something else must raise, either the EA or vP. If the EA raises (but still with v/V raising to a higher position), we have the Celtic/Semitic type of VSO language; if vP raises, we have the Austonesian type of VSO/VOS language, as we will see directly. GDA predicts these two types of V-initial system.

Turning next to (17c), this structure can derive VOS order. As is well known, this order is general in Malagasy (Pearson 2001, 2005). VOS order also alternates with VSO in many verb-initial languages of the Austronesian/Mayan type discussed above. In the VOS order the

object fails to show case (Niuean) or definiteness (Chol) marking, and has an obligatory indefinite interpretation, as illustrated by the following examples. The case of Niuean, first:

(18) a. Ne inu kofe a Sione. (Niuean VOS)
Past drink coffee Abs Sione
"Sione drank coffee."
b. Ne inu e Sione e kofe. (Niuean VSO)
Past drink Erg Sione Abs coffee
"Sione drank the coffee."

And the case of Chol:

(19) a. Tyi i- kuch- u (*jiñi) si' aj- Maria. (Chol VOS)
PRFV A3-carry-TV DET wood DET Maria
"Maria carried wood."
b. Tyi i- kuch- u aj- Maria *(jiñi) si'. (Chol VSO)
PRFV A3-carry-TV DET Maria DET wood
"Maria carried the wood."

As both Massam and Coon argue (see also Clemens & Coon 2018 where a different analysis is proposed for Chol), the object undergoes a form of incorporation into the verb in these orders. Again, this is consistent with these languages adopting the head-movement value of (10) and, again, we predict general head-initiality and head-marking.[18] However, here the verb also moves, instantiating the basic option found across Romance. This indicates that these languages too take the head-movement option in (10), although the VP-movement in free inversion must then be considered something other than a repair option.[19] Still assuming copies do not count for labelling, the derived structure after VP-movement out of vP in (17c) is asymmetric since it contains just the copy of VP, as shown in (17c), the head v and the EA, an XP. This is therefore a case of (4a), and v labels the residual category as vP, hence the EA is not required to move.

Alternatively, we could treat the constituent formed by merging the EA to VP as a kind of small clause, the predicative nexus of the "large" clause, eliminating v. In that case, if we continue to follow Chomsky's (2013, 2015) assumption that lower copies are not relevant for labelling, then we predict that after the VP is moved out of the small clause α, and presumably other predicative categories, are labelled as nominal in these languages since the EA will contribute the label. There is some support for this idea, at least in Niuean where verbs may be "participial or even nominal in nature" (Massam 2005: 240), from which it follows that predicates are too. A consequence of not assuming v is that in VSO orders with the structure in (17b), V/v-movement must facilitate Case-licensing of the IA in some way. VSO languages of this type tend to be ergative, consistent with the idea that the ergative-marked EA is frozen in place; being frozen in place only relates to movement, and so we do not exclude the possibility that an ergative EA may agree (see Bobaljik 2008).

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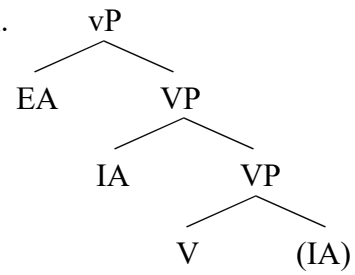
18 Note that FOFC is relevant here, in that if a system opts for the head-movement option in (10) at the lowest structural level it cannot "flip" to rollup at higher levels, on pain of violating FOFC. On the other hand, a system opting for rollup at the lowest level can "flip" to head-movement at higher levels, giving various permitted forms of disharmonic orders (and, presumably, mixed head- and dependent-marking).

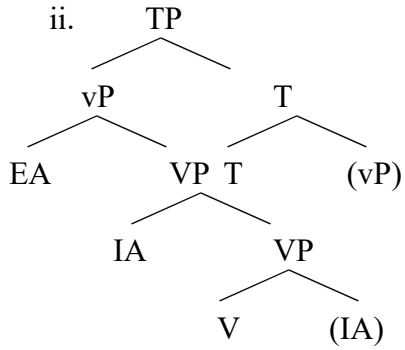
19 There may be a further option of rescuing the symmetrical structure by moving the VP to a higher position without verb-movement, much as it happens in causatives in Italian such as in … *far [$_{\alpha}$ [$_{VP}$ lavare la macchina] a [Gianni t]* (make clean the car to Gianni; "make Gianni clean the car") according to the analysis proposed in Guasti & Moro 2001. This may be a motivation for smuggling derivations in general, including in passives in many languages; see Collins (2005) and the papers in Belletti & Collins (2020).

In addition to the options underlying basic SVO, VSO and VOS seen in (17), we have the rollup option shown in (20):

(20) i.



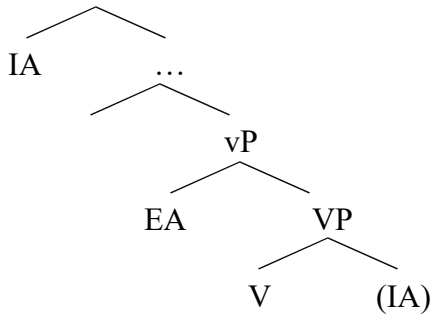
ii.



Notice that movement of IA to the left of V is not directly caused by the necessity to rescue a POS but it is related to it:[20] the rollup movement of IA takes place as a generalisation (by Input Generalisation as in (11)) of the rollup of the Root in a system where the Move Y option is taken for the Second-Merge parameter in (10). In other words, this solution to the Ignition Problem conditions the generalisation of roll-up movement.[21] This, of course, straightforwardly derives SOV order along with the possibility (a preference, given Input Generalisation) for general head-final orders and dependent-marking. The raised vP in (20ii) constitutes a POS unless the EA moves away; this does not alter the derived SOV word order.

A final possibility for avoiding the *in-situ* structure in (16) is movement of the IA alone out of vP to some higher position (whose exact identity is not crucial to the argument here), shown in (20):

(21) *

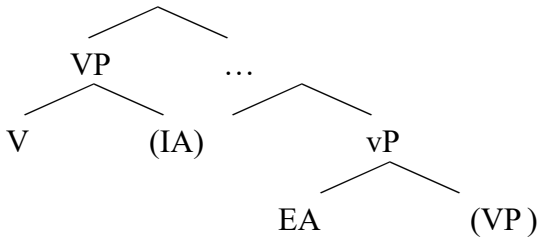


[20] Neither does rollup of the IA create a POS since we assume it is adjunction. VP is a labelled as such since it is a head-complement construction and the raised IA asymmetrically c-commands V and so is linearised so as to precede it. See Note 6 for discussion of Kayne's definition of c-command, along with the distinction between segments and categories.

[21] This entails that the structure of VP shown in (20) is simplified. What we have called "V" here is in fact a complex structure of the form in (8). In turn this implies that there are two v's: one forming the "V" head and the other, as shown in (20) introducing the EA.

Here the POS between EA and VP is not repaired and so this derivation is ruled out. In cases where the IA does appear to raise out of vP, possibly leaving the EA in place, e.g. passives, a smuggling derivation of the kind proposed by Collins (2005, 2023), raising the whole VP, is required; see also Note 19. Smuggling gives rise to a derived structure like (22):

(22)



In an English passive, IA undergoes further movement out of VP to SpecTP. This further raising of the IA would require a different analysis involving a predicative relation which we cannot pursue in detail here.[22]

Summarising the main point of this section, we can reformulate the results in an informal way by referring to the two major components of this approach: the typological patterns result from two independent factors, namely symmetry-breaking operations (DA) and the maximisation of these operations (Input Generalisation). We are aware that these typological remarks require a great deal of further substantiation, and a range of structures involving clitics, smuggling and other patterns of (remnant) VP-movement need to be considered, but we believe that this alternative view is of interest also because it brings cognitively relevant elements into the explanation. We thus see the prospect of a cognitively based account of typological generalisations.

It is also clear that our proposals do not amount to a general account of how to derive the principal Greenbergian word orders, still less a prediction as to their differing incidence in the world's languages. For one thing, we have nothing to say about the object-initial orders OVS and OSV. Furthermore, it is by now clear that SVO, SOV and VSO orders are not uniform "types"; since Pollock (1989) it has been known that the position of V can vary significantly in SVO languages (and see Schifano 2018 for documentation of significant microvariation V-positions in Romance, all SVO languages; see also Kayne 2022 for further remarks on linear order and (S)VO/OV). Further, while it may be correct to characterise (Early) Latin, German and Japanese as SOV languages, these languages differ significantly in a number of more fine-grained word-order properties. Finally, we saw above that there are at least two quite distinct types of VSO language. Our aim here, on the other hand, has been to derive some of the effects of the former Head Parameter (Koopman 1984, Travis 1984) and to comment on the different possibilities of raising the EA, v/V, the IA or VP from vP. Our fundamental interest resides in the effects of DA.

[22] Of course, the analysis of voice alternations remains open (but see Kallulli & Roberts 2022 for a new proposal). In any case, a theory of predication is needed.: a proposal which is consistent with the DA analysis is put forward in Moro (2019): predication is encoded in grammar via a symmetric XP XP relation, implying that predication always triggers movement. This issue is independent of the possibility of raising the IA over the EA in languages which allow VP movement, such as in Italian postverbal subject constructions like: [VP legge un libro] … [SC Gianni t]] (reads a book Gianni; "Gianni reads a book"). See also Note 19.

5. Conclusion.

In this paper we proposed generalising DA to head head relations in a comprehensive way. While this view raises many further questions, we can nevertheless highlight two principal ideas: (i) movement is a repair operation potentially driven by linearization and labelling, different requirements imposed by different interfaces, with the possibility of morphological restrictions on landing sites; (ii) the "ignition" of every derivation always starts with the generation of a symmetrical head head structure, whose symmetry is "broken" by different movement operations which generalise to arguments, i.e. to XPs, in such a way as to give rise to word-order harmony in the unmarked case. Both claims have a number of consequences both on theoretical and empirical grounds which of course cannot be exhaustively addressed in a single paper, let alone fully developed. In this paper, however, we highlighted two of them on each ground.

First, on theoretical grounds, we proved that DA offers an independent motivation for the existence of Internal Merge (Section 4.1). By repeating the claim here, the core idea is that since grammar allows for Merge to be symmetric and symmetrical structures are unstable, it follows that Internal Merge is required at some point in the derivation:

(15) For all X, Y where X and Y share the same value of [minimal] and [maximal] (i.e. where both are heads or both are XPs):

Merge {X, Y} → Z => Merge {X, Z} or Merge {Y, Z}

Second, on empirical grounds, on the other hand, we have explored some of the immediate consequences of DA for typology (Section 4.2): in fact, (ii) above allows us to conclude that third factor Input Generalisation applying to the head-movement and rollup based repair strategies seen in (10) gives rise to the basic options of head-initial and head-final structures. In other words, the way the ignition problem is solved conditions the typological phenotype.

There is an important conceptual question behind what we propose here which is worth highlighting once more. Many cases of symmetry-breaking movement turn out to be driven both by labelling and linearization requirements, such as copular sentences (see also the list at the end of section 2 of this paper). This may seem like an undesirable redundancy in Universal Grammar, something to be eliminated if possible but, insofar as the analyses based on DA are tenable, a different question should rather be raised, namely whether all cases of symmetry-breaking phenomena are redundantly forced by both linearization and labelling reasons. Linearisation (or linearizability) is imposed by the PF interface (including inner speech, see the neurobiological data in Magrassi et al. 2015; for externalisation issues see also Moro 2016 and Moro - Chomsky 2023) while labelling is a legibility requirement imposed by the CI interface as assumed in the minimalist framework ever since Chomsky 1995 (see also Chomsky et al. (forthcoming) and Gallego - Chomsky 2020). This is encapsulated in the definition of stability given in page 3 and reproduced here for convenience:

> Formally, a structure Σ is stable iff both conditions are satisfied: (i) Σ is linearisable at PF: it must be LCA-compliant/legible so that the terminals can meet the requirements for a locally total linear ordering; (ii) Σ is labellable throughout the derivation: without labels, syntactic objects cannot be "seen" by the operations of the system (including Merge) in particular the CI interface.

Our analyses offer empirical evidence that there is no absolute overlapping between labelling and linearisation, neither there is any theoretical necessity for overlap: rather, if DA is correct, linearization and labelling being independently required by the two virtually necessary distinct interfaces, it is only natural for syntax to reflect this twofold nature. Moreover, the fact that a single operation, namely Merge, provides a way to satisfy both interface conditions could be considered as a support of the Strong Minimalist Thesis in the sense of Chomsky (2000).

In other words, if narrow syntax is truly just interface-driven and if these are the only two interfaces which count for human language, the existence of a single formal operation which makes possible the satisfaction of both conditions is an optimal solution for linguistic computation.

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