In support of an OT-DM model: Evidence from a morphological conspiracy in Degema

This paper provides support for a modified DM model which I call Optimality Theoretic Distributed Morphology (OT-DM). The strongest form of this model is that all morphological operations take place in parallel, which I call the Morphology-in-Parallel Hypothesis (MPH). Although combining OT and DM is unorthodox in practice, I show that a growing body warrants his modification (Trommer 2001a, 2001b, 2002; Dawson *in press*; Foley *to appear*; a.o.), and provide evidence for OT-DM from a morphological conspiracy involving verbal clitics in Degema (Nigeria). To account for this conspiracy, I argue that agreement clitics are inserted post-syntactically via the DM operation Dissociated Node Insertion (DNI), and further that verb complexes are formed post-syntactically via the operation Local Dislocation (LD). I argue that both these operations are triggered by a well-formedness markedness constraint which requires verbs to appear in properly inflected words on the surface. These DM operations are decomposed into a series of constraints which are crucially ranked. Candidates are freely generated from GEN and are subject to all DM operations, and are evaluated via EVAL against the ranked constraint set. I illustrate that under standard views of DM in which DNI proceeds VI, a serial model results in an ordering paradox, and that even after parameterizing DM operation ordering in response, this model does not adequately account for the morphological conspiracy.

distributed morphology
optimality theory
morphological conspiracy
clitics
serial verb constructions
African linguistics

1. Introduction

This paper seeks to contribute to refining a generative model of the interface between syntax and phonology/phonetics. As a starting point, I adopt the major tenets of Distributed Morphology (DM) (Halle & Marantz 1993), one of which being that the syntactic module generates a structure which is then manipulated in a morphology module post-syntactically via a number of operations. These operations include vocabulary insertion, linearization, local dislocation, prosodic inversion, impoverishment, fusion, fission, dissociated node insertion, among others. The orthodox view of DM is that it has a localist rather than globalist architecture (Embick 2010), within which these operations take place serially in a specific order (e.g. Arregi & Nevins 2012).

In contrast, this paper maintains the core assumptions of DM but implements it within a constraint-based Optimality Theory (OT) model, which I call **Optimality Theoretic Distributed Morphology** (**OT-DM**). The strongest form of this model is that all morphological operations take place in parallel, which I call the **Morphology-in-Parallel Hypothesis** (**MPH**). Although combining OT and DM is unorthodox in practice, I show that a growing body of work overtly or covertly adopts it (Trommer 2001a, 2001b, 2002; Dawson *in press*; Foley *to appear*; a.o.), and illustrate that an OT-DM model is necessary to account for a **morphological conspiracy** in Degema, a language of southern Nigeria. Under OT-DM, syntax can be understood as generative and contains only syntactic operations (e.g. MERGE) while post-syntax is strictly evaluative and consists of familiar OT components (EVAL, GEN, CON, etc.).

The core data from Degema I introduce to support this position involve the distribution of verbal clitics in serial verb constructions. All verbs are marked with a proclitic expressing subject agreement and (when applicable) an enclitic expressing aspect, a cl=[V]=cl structure. In serial verb constructions, when the verbs are adjacent or when only a prosodically light pronoun intervenes, the proclitic appears on the first verb and the enclitic appears on the last verb. I refer to this as the **single-marking clitic pattern**. In contrast, when the verbs are separated by a prosodically heavy constituent, each verb is marked by a proclitic and enclitic. I refer to this as the **double-marking pattern**. These patterns' complementary distribution is shown below.

V_1 ___ V_2	Double-marking		Single-marking	
Ø	*	cl=[V_1]=cl cl=[V_2]=cl	√	cl=[V_1 V_2]=cl
Pron$_\sigma$	*	cl=[V_1 **D$_\sigma$**]=cl cl=[V_2]=cl	√	cl=[V_1 **D$_\sigma$** V_2]=cl
DP/Pron$_{\sigma\sigma}$	√	cl=[V_1]=cl **DP/D$_{\sigma\sigma}$** cl=[V_2]=cl	*	cl=[V_1 **DP/D$_{\sigma\sigma}$** V_2]=cl

Table 1: Complementary distribution of clitic marking in SVCs

I analyze certain of these clitics as agreement nodes which are inserted post-syntactically via the DM operation **Dissociated Node Insertion (DNI)**. Further, I analyze the verb complex in single-marking structures as a single morphological word which is formed post-syntactically via the operation **Local Dislocation** (**LD**). I argue that both these operations are triggered by a well-formedness constraint which requires verbs to appear in properly inflected words on the surface, and can therefore by understood as forming a conspiracy in the sense of Kisseberth (1970). Both of these operations apply in parallel. Informally, if the verbs are sufficiently local defined prosodically, they may form a constituent to 'share' the clitic marking resulting in single-marking via LD; if however they are not sufficiently local, each verb receives its own set resulting in double-marking.

I implement this within the OT-DM model. The DM operations are decomposed into a series of constraints which are crucially ranked, e.g. LD is decomposed into constraints Markedness constraints (e.g. MWD=PRWD), Alignment constraints (e.g. ALIGN-/asp/-R), and Mapping constraints (e.g. LinearityMap-IO, MAP(WD_TYPE)). Candidates are freely generated from GEN and are subject to all DM operations, and evaluated via EVAL against the ranked constraint set. Under OT-DM, DM operations are freely licensed but only those candidates which are selected as optimal surface and demonstrate their effects. I illustrate how this model correctly generates the Degema clitic patterns, and adequately captures the morphological conspiracy. I contrast this model with three inadequate alternatives: a serial rule-based DM account, an account of single-marking via syntactic verb movement, and an account of single-marking via deletion-under-identity of intermediate clitics. With respect to the first alternative, I illustrate that under standard views of DM in which DNI proceeds VI, a serial model results in an **ordering paradox**, and that even after parameterizing DM operation ordering in response, this model does not adequately account for the morphological conspiracy.

This paper is organized as follows. Section 2 presents the major tenets of DM, and compares two different DM models, Rules & Constraints DM vs. OT-DM. Section 3 presents the core data involving clitics in Degema serial verb constructions, as well as core assumptions of the syntax of these structures. Section 4 presents a first pass DM analysis, introducing post-syntactic DM operations (DNI and LD), illustrating how evidence from grammatical tone supports the constituency of V+V verb clusters under adjacency, and discusses core problems in assuming a standard serial rule-based DM model of this data. Section 5 presents the core of the OT-DM analysis, introducing the constraint set, the candidate set, and the evaluation. Finally, section 6 presents arguments against two competing alternative accounts of this data, section 7 discusses the ramifications of OT-DM for post-syntactic architecture, and section 8 provides the conclusion. Two appendices are included which further detail the OT model.

2. Distributed Morphology, conspiracies, and constraints

2.1. **Context of DM**

One prominent theory which has emerged in parallel with Minimalism is **Distributed Morphology (DM)** (Halle & Marantz 1993, 1994; Halle 1997; Marantz 1997; Harley & Noyer 1999; Embick & Noyer 1999, 2001, 2007; Embick 2007a, 2007b, 2010; Embick & Marantz 2008; Siddiqi 2009, 2010; Arregi & Nevins 2012; Matushansky & Marantz 2013; Bobaljik 2017; a.o.). The core analytic move of DM is that morphology is distributed across several components of Grammar. Traditional 'morphemes' are decomposed into morphosyntactic feature bundles, i.e. roots and functional heads from the **Feature Lexicon** (=*narrow lexicon* – Marantz 1997:204), which are manipulated by standard syntactic operations. Other components of the traditional 'morpheme' are filled in post-syntactically in a later module. On the PF branch, **Vocabulary Items** from the **Vocabulary** insert phonological information; on the LF branch, idiosyncratic meaning comes from the **Encyclopedia**.

Conceptually, DM's theoretical commitments can be distinguished by a number of tenets along several logically separate axes.

(1) Tenets of DM
   a. Module Order: Syntax precedes morphology
   b. Internal Complexity: Internally complex words are the concatenation of morphosyntactic feature bundles
   c. Uniform Concatenation: Morphologically complex words are formed via the same operations concatenating words in clauses
   d. Phonology-Free: Syntax/semantics lack phonological features
   e. Feature Realization: Vocabulary Items realize features already present
   f. Bundle Manipulation: The output of feature bundles from syntax is manipulated via morphological operations
   g. Derivation Architecture: Input-to-output mapping is serial and rule-based

The first tenet **Module Order** is that syntax precedes 'morphology', which itself is decomposed into one or more post-syntactic modules. Morphology is not a module which takes place before or parallel to syntax as a whole. Second, **Internal Complexity** states that internally complex words result from concatenation of morphosyntactic feature bundles. This is in contrast with **Inferential** models of morphology which posit no word-internal structure and derive morphologically complex words by root/stem manipulation, e.g. Anderson's (1992) *A-Morphous Morphology* and Stump's (2001) *Paradigm Function Morphology* (see discussion in Inkelas 2014:241). Third, **Uniform Concatenation** states that morphologically complex words are formed via the same operations concatenating words in clauses, namely MERGE. This is therefore a strictly **Non-Lexicalist** theory of morphology, in which all words regardless of internal complexity have 'syntax-all-the-way-down' (Bobaljik 2017); 'wordhood' here is largely epiphenomenal. This contrasts with **Lexicalist** theories where there is a separate computational system which builds words independent from operations in syntax. Fourth, syntax and semantics are **Phonology-Free** and lack the presence of and sensitivity to phonological features ("nodes consist entirely of morphosyntactic/semantic features and lack phonological features" - Halle & Marantz 1993:121). Fifth, **Feature Realization** refers to the fact that vocabulary items (VIs) expone syntactic feature bundles and thereby realize syntactic features rather than introduce them (**Late Insertion** in DM terminology). This **Realizational** model contrasts with an **Incremental** model, in which the morphemes themselves introduce relevant syntactic/semantic features (Stump 2001). Sixth, **Bundle Manipulation** refers to the output of syntax - which consists of bundles of morphosyntactic features – able to be manipulated via morphological operations (or 'adjustments'), e.g. adding or deleting features. Finally, **Derivation Architecture** refers to the fact that in standard DM, post-syntactic operations apply serially, formalized as ordered rules which can feed or bleed one another. It is only this last tenet that the OT-DM model challenges and is the focus for the rest of the paper.

2.2. **Morphological conspiracies**

In rule-based phonological theory, a **conspiracy** refers to situations where rules with dissimilar inputs, outputs, and/or environments result in surface forms which all converge on or avoid a specific structure. The challenge of conspiracies for phonological theory was most famously presented in Kisseberth (1970) using data from Yokuts [yok] (=Yowlumne/Yawelmani; California, USA – Newman 1944). Yokuts has a number of rules involving vowel insertion, vowel deletion, and consonant deletion. In the simplified sample of rules is in (2), rules *i-Epenthesis* and *C-Deletion* have distinct inputs, outputs, and environments, but they both can be understood as avoiding a tautosyllabic consonant cluster, i.e. a 'derivational constraint' on surface structures, a shorthand for which is *CC.

(2)   Rules in the Yokuts phonological conspiracy avoiding *CC
    a.   i-Epenthesis: Ø → i / C_CC
    b.   C-Deletion: C → Ø / CC+_
    c.   Final V-Deletion: V → Ø / VC_#

Further, the non-application of a rule also conspires to avoid this constraint. *Final V-Deletion* in c. deletes word-final vowels if it is preceded by a VC sequence, but not if it is preceded by a CC sequence as this would create a banned surface structure. Conspiracies can also be analyzed as operating parametrically across languages, e.g. the cross-linguistic dispreference for vowel hiatus has a variety of repairs, e.g. vowel deletion, coalescence, gliding, and glide insertion among them. All of these rules can be understood as avoiding a sequence *VV.

Such conspiracies acted as catalysts in the development of parallelist constraint-based evaluation in **Optimality Theory** (**OT**), given that such conspiracies are in fact predicted from a constraint-based model and are not readily captured in a rule-based one (Prince & Smolensky 2004 [1993]; Kager 1999: Sec. 2.1.1.2; McCarthy 2002:Sec.3.1.4.3, 2008:1-12; Bermúdez-Otero & Börjars 2006:720; Kisseberth 2011; a.o.). A **morphological conspiracy** therefore is surface structure convergence or avoidance involving morphological (i.e. non-phonological) inputs, outputs, and environments. Unlike in phonological theory, however, morphological conspiracies have played virtually no role in the major developments of morphological theory. Despite their minor role, several morphological conspiracies have been identified in the literature. I highlight here two very different responses to conspiracies within DM theory, one maintaining ordered rules and the other proposing strictly parallel constraints.

2.3. **Rules & Constraints DM**

One response to morphological conspiracies is exemplified by Arregi & Nevins' (2012) thorough investigation of Basque morphosyntax. They posit a series of ordered morphological modules in a rule-based DM model, summarized below.

(3) Ordered morphological modules (Arregi & Nevins 2012:4)
[…syntactic operations…]
1. Exponence Conversion (e.g. agree-copy, fission)
2. Feature Markedness (e.g. participant dissimilation)
3. Morphological Concord (e.g. complementizer agreement)
4. Linearization
5. Linear Operations (e.g. clitic metathesis/doubling)
6. Vocabulary Insertion
[…phonological operations…]

Arregi & Nevins highlight a number of surface patterns across Basque dialects which conspire to place T° auxiliaries in a specific position. One such conspiracy is avoiding an auxiliary being initial in its relevant domain. Several processes 'conspire to make T surface in second position', which include cliticization of an absolutive marker (*Absolutive Cliticization*), metathesis and doubling of an ergative marker whose application depends on the dialect (*Ergative Metathesis and Doubling*), and the insertion of an epenthetic dummy morpheme before T° (*L-Support*).

To unify these distinct repairs, Arregi & Nevins posit a well-formedness constraint T-NONINITIALITY (Arregi & Nevins 2012: 276). This constraint acts as an inviolable filter that outputs must comply with, and triggers 'repairs' which vary by environment/module and by dialect. By employing both rules and constraints, Arregi & Nevins propose a significant modification to the standard DM model, which I refer to as **Rules & Constraints Distributed Morphology (R&C DM)**. Their modification to DM's rule-based architecture in response to output-oriented well-formedness conditions is directly parallel to the events in pre-OT phonology, such as Paradis' (1987) *Constraints and Repair Strategies* (for further discussion see, Prince & Smolensky 2004 [1993]: 247-252 and Kiparsky 2017:396).

It is crucial to note that Rules & Constraints DM explicitly rejects a more radical OT model involving parallelist constraint based evaluation. The standard DM framework and the OT framework are often accepted as having conflicting assumptions, with Embick (2010:*ix*) explicitly stating that DM 'is incompatible with the dominant view in phonological theory, Optimality Theory (OT), which posits competition among infinite sets of complex objects' (similar sentiments are observed by Tucker 2011:200). Strict versions of DM – especially as formalized by Embick & Marantz (2008) and Embick (2010) – reject parallelism and constraint-based evaluation, as well as blocking effects and optimization. Across morphological theory generally, Embick (2010:11) refers to a **Globalist/Localist Schism**, where Globalist theories of morphophonology such as OT 'require competition between multiple potential expressions of a given input', whereas this is impossible under Localist theories 'because the competitors are not derived by the grammar'. In general, constraints and their 'repairs' play no role in the majority of recent work in DM, largely due to not being pertinent to the specific phenomenon at hand (e.g. Matushansky & Marantz eds. 2013[1]; Salzmann 2013; Haugen & Siddiqi 2013; Harley 2014; Gribanova 2015; Watanabe 2015; Moskal 2015; Moskal & Smith 2016; Deal 2016; Kinjo & Oseki 2016; Saab & Lipták 2016; Martinović 2017; a.o.).

2.4. **OT-DM**
A different set of data and conspiracies has generated the opposite response in other DM practitioners who have sought to incorporate OT into DM architecture. I refer to this model as **Optimality Theoretic Distributed Morphology** (**OT-DM**). Although there has been quite limited cross-pollination between the OT and DM frameworks, there was early research tying them together, noting in particular the fact that they emerged in the same (generative) linguistic period (e.g. Noyer 1992, 1993, 1994; Bonet 1994; see Wolf 2008:141). For example, some of the earliest integration include Noyer (1992) involving DM-style impoverishment 'achieved by the interaction of inviolable surface constraints and universal feature hierarchies' (Trommer 2001a:71). Trommer's own work (2001a, 2001b, 2002) such as his *Distributed Optimality* model argue that 'crucial mechanisms of DM can be replaced profitably the interaction of violable constraints as in OT' (2001a:12). Models such as Rules & Constraints DM later proposed by Arregi & Nevins (2012) fall under what Trommer calls the *Filter & Hierarchy* approach to DM, a 'filter' being an inviolable (markedness) constraint. Trommer supports his program by citing a number of conspiracies, e.g. a conspiracy involving argument marking of transitive predicates in Dumi [dus] (van Driem 1993;

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[1] OT plays a small role role in Matushansky & Marantz (eds.) (2013), namely in Bonet's chapter (Bonet 2013).

Trommer 2001a:66-67,81-83,404-412), as well as cross-linguistic conspiracies such as an anti-homophony constraint resulting in clitic substitution in Italian but deletion in Spanish (Grimshaw 1997, Trommer 2001a:14).[2]

One recent OT-DM paper involving a morphological conspiracy is presented in Dawson (in press) for Tiwa [lax] (Sino-Tibetan: India). In Tiwa, Dawson identifies that verb roots are prosodically bound, requiring material to their right in the same prosodic word. She formalizes this morphophonological requirement with a markedness constraint *BARE-V. In nearly all contexts, the verb appears with an overt suffix due to independent morphosyntactic properties, and thereby vacuously satisfies the *BARE-V constraint. One exception is with auxiliary verb constructions where an auxiliary selects a bare verb, in violation of *BARE-V. To remedy this, Tiwa employs two repairs in free variation. In one, the verb and the auxiliary integrate and form a single complex phonological word, with the verb cliticizing to the right-adjacent auxiliary. I refer to this as *Verb Cliticization*, shown in (4)a. Dawson argues that the phonological wordhood of the V+Aux complex is supported by the fact that certain word medial consonants in this complex undergo intervocalic voicing. Further, in a second repair, a morphosyntactically higher Focus head which canonically attaches to the right edge of the language attaches instead to the verb. Dawson calls this *Focus Drift*, shown in (4)b. She provides a number of arguments that the position of the focus clitic does not express additional focus semantics on the verb, suggesting post-syntactic reconfiguration.

(4) Tiwa repairs for constraint *BARE-V
    a. Verb Cliticization: Complex phonological word formation
        V Aux Foc → (V=Aux=Foc)
        ($_\omega$ **lí**=thái-do=sê)
        lí   thái-do   =sê
        go   AUX-IPFV   =FOC
        'he is *still* going'
    b. Focus Drift: Cliticization of focus onto a verb
        V Aux Foc → (V=Foc) (Aux)
        ($_\omega$ lí=**sê**) ($_\omega$ thái-do)
        lí   =**sê**   thái-do
        go   =**FOC**   AUX-IPFV
        'he is *still* going'

These repairs form a conspiracy, as in both cases the output is a verb which receives an appropriate 'host' and thereby satisfies *BARE-V. Dawson shows that these data cannot be reduced simply to DM operations Lowering or Local Dislocation (as well as prosodic inversion), and argues that the data necessitates a model that 'explicitly incorporates the constraint-driven component into DM'.

Independently, Foley (to appear) recently discusses a morphological conspiracy involving multiple exponence in Georgian verbal paradigms, part of a larger program *Optimal Vocabulary Insertion*. Foley adopts an OT-DM analysis and shows that although an alternative classic DM account can 'captures the facts, … it has little explanatory power [as] the collection of impoverishment rules makes no reference to multiple exponence' directly (a parallel line of argument ion is adopted later for Degema).

There are several other works which envision more broadly some type of interaction between DM and OT components, including Haugen (2008, 2011), Wolf (2008), Lahne (2010), Tucker (2011), Sande (2017), and Brown (2017), with Impoverishment in particular being implemented within an OT-DM model (Don & Blom 2006; Opitz 2008; Keine & Müller 2015). Outside of DM, morphological theory has embraced and contributed to constraint based modeling, summarized in Xu (2016), examples including *Cophonology Theory* (Inkelas & Zoll 2007), *Optimal Construction Morphology* (Cabellero & Inkelas 2013), *Stratal OT* (Kiparsky 2015), a.o. Further, a strong view of constraint-based modeling has been adopted by pracitioners of OT Syntax, important works including Grimshaw (1997, a.o.), Legendre et al. (2001), Broekhuis & Vogel (2013), Legendre et al. (2016). a.o.

3. Degema: core data and assumptions

3.1. **Inflectional clitics**

Degema [deg] is a Benue-Congo language of the Niger-Congo phylum spoken in southern Nigeria.[3] It is a head-initial language, and maintains a fairly strict SVO word order in which auxiliaries precede the verb and adjuncts

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[2] Wolf (2015:385) also cites conspiracies as a deciding factor in employing phonologically conditioned suppletive allomorphy via constraints rather than through arbitrary sub-categorization restrictions.

follow the object (including adverbials, CPs, PPs, and ideophones). Degema possesses a series of inflectional proclitics and enclitics which obligatorily adjoin to the verb. Proclitics principally expone subject agreement, though can additionally index tense/aspect and polarity. Agreement proclitics form two sets. Set 1 are used in positive polarity, non-past tense constructions, and all begin with /m/; set 2 appear elsewhere and are vowel initial other than first person singular. Throughout this paper, clitics are marked with PHI-features and as SET1 or SET2. Third person plural is further split into two sets of markers: one which appears with third person plural human referents [+H], and those which appear with third person non-human referents [-H]. Tone and ATR variations involving these clitics are not indicated in Table 2, though are discussed below.

Infl proclitics	1st		2nd		3rd			
	Set 1	Set 2	Set 1	Set 2	Set 1		Set 2	
SG	me	mi	mu	u	mo		o	
PL	me	e	ma	a	+H	-H	+H	-H
					me	mi	e	i

Table 2: Degema proclitics[4]

Degema has two inflectional enclitics which expone aspect. Factative aspect ó=V̄n FAC express perfective aspect / past tense with eventive verbs and present tense with stative verbs. This clitic co-occurs with a high tone on the verb root, and copies the final vowel of the verb if it is vowel final. Additionally, the perfect aspect marker is ó=tē PRF. Kari (2002a; 2002b; 2002c; 2002d; 2003; 2005) presents arguments that both proclitics and enclitics are clitics and not affixes, a position I adopt here but do not elaborate on or defend.[5] Clitics are illustrated in (5).

(5) Degema inflectional clitics[6]
   a. **me**=síré
     1SG.SET1=run
     'I am running' (Kari 2004:286)
   b. Ohoso   **ǫ**=sá=**n**   ēnám   Cf. *Ohoso Ø sá=**n** ēnám / *Ohoso **ǫ**=sá Ø ēnám
     Ohoso   **3SG.SET2**=shoot=**FAC**   animal
     'Ohoso shot an animal' (Kari 2004: 270)
   c. **mị**=ḍé=**té**   ọsama   Cf. *Ø ḍé=**té** ọsama / ***mị**=ḍé Ø ọsama
     1SG.SET2=buy=**PRF**   dress
     'I have bought a dress' (Kari 2004: 293)

The only elements which may intervene between the proclitic and the lexical verb are functional auxiliary verbs, a closed class with 12 members. Auxiliaries are outside of the scope here (although see fn X).
   Further, the only elements which may intervene between the enclitic and the lexical verb are prosodically light object pronouns. Example (6)a illustrates that when a verb and aspectual enclitic appears with a bisyllabic pronoun

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[3] Data for this paper comes from the extensive publications on Degema by native speaker-linguist Ethelbert E. Kari (Kari 1997, 2002a, 2002b, 2002c, 2002d, 2003a, 2003b, 2004, 2005a, 2005b, 2006, 2008, 2015), as well as ongoing joint collaboration. Additional consultation with a native Degema speaker was done by the author, summer 2017 in Port Harcourt, Nigeria. Degema has two dialects: Usokun and Ạtala (also called 'Degema Town'). The current paper is based on the Usokun variety only. Information on the Ạtala dialect is found in Offah (2000), which reveals a different distribution of clitics (see especially pps. 7,30,33,46-48,57,66-70,79; email me for a copy).
[4] The distribution of these sets is more complex than this but falls outside of the scope of this paper. What is important to note is that these two sets are in syntactic complementary distribution. Further, in negative-imperative sentences, the second-person singular subject clitic is exponed as e/ẹ=; a marginal subject clitic a= also exists, but only attaches to the bound copular verb bọ 'be present' (Kari 2004, 2008: 21); and the non-human variant in 3PL also appears with mass nouns [+M], which have no singular/plural morphological distinction.
[5] Degema has four additional verb-adjacent enclitics which do not expone aspect, not discussed here. These are =tu 'don't do X', =munu 'stopped X', =vire 'too much', and =ani 'please' (Kari 2004:340).
[6] Degema orthography is consistent with the IPA, with the following language-specific conventions: <ɓ> = /ɓ/, <ɗ> = /ɗ/, <nw> = /ŋʷ/, <ny> = /ɲ/, <y> = /j/, <ñ> = /ŋ/, and <v>=/β/. A dot under a vowel indicates retracted tongue root [-ATR], and no dot under the vowel indicates advanced tongue root [+ATR]. ATR is only marked on the first vowel of the word, though ATR harmony applies to all vowels within the word. A high tone is indicated by an acute accent <V́>, a downstepped high is indicated by a macron <V̄>, and a low tone is not marked.

o̩yí 3SG 'him/her/it' or ení 1PL 'us', the enclitic adjoins to the verb. In contrast, (6)b-c show that if the verb appears with a monosyllabic pronoun, the enclitic must attach to the right edge of that pronoun, and not directly next to the verb. Other orders are ungrammatical.

(6) Surface position of enclitics with monosyllabic object pronoun
    a. Osoabo   o=kótú=**n**   óyi   Cf. *Osoabo o=kótú óyi=**n**
        Osoabo   3SG.SET2=call=**FAC** him/her
        'Osoabo called him/her' (Kari 2004: 113)
    b. o=kótú   wó̩=**ōn**   Cf. *o=kótú=**n** wo̩
        3SG.SET2=call   you=**FAC**
        '(s)he called you' (Kari 2004: 276)
    c. o=gídí   ḅáw=**tē**   Cf. *o=gídí=**té** ḅāw
        3SG.SET2=look.for   them=**PRF**
        '(s)he has looked for them' (Kari 2004: 282)

These facts are summarized in the table below. The shading indicates the pattern where the enclitic attaches to pronoun rather than the verb.

	1	2	3	XP {NP/CP/PP/etc.}
SG	méē/mé̩ē̩ V pron=**CL**	wó̩ō V pron=**CL**	o̩yí V=**CL** pron	V=**CL** XP
PL	ení V=**CL** pron	máāny/má̩āny V pron=**CL**	ḅáāw/ḅá̩āw V pron=**CL**	

Table 3: Attachment of enclitic with object pronouns

3.2. Serial verb constructions

Serial verb constructions (SVCs) are a widespread linguistic feature of West Africa (Ameka 2005) and are used extensively in Degema. Non-formally, they are defined as a sequence of more than one verb in a single clause which share verbal arguments and functional categories. In Degema, SVCs are used to express event exhaustion/completion, directionals, benefactives, verbal comparison, comitatives, instrumentals, accompanimentals, refusal, simultaneousness, abilitatives, consequentials, and event coordination (resultatives and purposives are not expressed through SVCs; see Kari 2003a, 2004 for further details).

When inflectional clitics appear in SVCs, two patterns in complementary distribution are seen. One is the **double-marking pattern** in which each verb in series is marked with an identical proclitic and enclitic respectively, in (7)a. A second is the **single-marking pattern** in which only the first verb is marked with a proclitic while only the last verb is marked with an enclitic. This 'bookending' pattern is shown in (7)b.

(7) Clitic patterns
    a. Double-marking SVC pattern
        o=sóm=**n**   ú̩sī   **o**=túl   wó̩=**ōn**
        3SG.SET2=be.good=**FAC** beauty **3SG.SET2**=reach you=**FAC**
        'He is as handsome as you.' (Kari 2004:157)
    b. Single-marking SVC pattern
        Ohoso **o**=sóm   túl=**n**   o̩yi
        Ohoso **3SG.SET2**=be.good   reach=**FAC** him
        'Ohoso is as handsome as him.' (Kari 2004:156)

The double-marking SVC pattern occurs when there is an intervening DP between the two verbs, i.e. the object ú̩sī 'beauty' in a. In contrast, the single-marking pattern occurs when there is no such intervening object as in b.

The only exception to this generalization involve prosodically light object pronouns. When these light pronouns appear between the verbs, the single-marked SVC pattern occurs despite this intervening element. For example, in (8)a the object pronoun is bisyllabic ó̩yi 'her/him' and the SVC displays double-marking. In contrast, in b the object pronoun is monosyllabic *me* 'me' and the SVC displays single-marking (recall from Table 2 that these same light pronouns also have a different distribution with respect to enclitics).

(8)
    a.   Double-marking pattern with bisyllabic pronoun
        mi̠=ɖúw=**n**   óyi   **mi̠**=tá=**ān**
        1SG.SET2=follow=**FAC**   her/him   **1SG.SET2**=go=**FAC**
        'I went with her/him' (Kari 2004: 201)
    b.   Single-marking pattern with monosyllabic pronoun
        Breno **o**=ɖúw   mé   tá̠=**ān**
        Breno **3SG.SET2**=follow   me   go=**FAC**
        'Breno went with me' (Kari 2004: 115)

In the double-marking environment where there is an intervening object (other than a prosodically light object), the single-marking pattern is ungrammatical here and both sets of clitics are obligatory.

(9) Ungrammatical single-marking in presence of intervening object
    a.   Tatane o=kótú=***(té)**   éni   ***(o̠)**=kpérí=tē   ínúm
        Tatane 3SG.SET2=call=***(PRF)**   us   ***(3SG.SET2)**=tell=PRF   something
        'Tatane has called us and told (us) something' (Kari 2003a: 285)
    b.   Tatane o̠=sá=***(n)**   ēnám   ***(o)**=gbíyé=ēn
        Tatane 3SG.SET2=shoot=***(FAC)**   animal   ***(3SG.SET2)**=kill=FAC
        'Tatane shot an animal dead', 'Tatane shot and killed an animal' (AUTHOR 201X:XX)

In contrast, in the single-marking environments where the verbs in series appear without an intervening object or only with a light object, the double-marking pattern is ungrammatical for some speakers but questionable for others. This variation is detailed in AUTHOR (201X:XX). The value $^{(?)}$ is acceptable but dispreferred, $^?$ is unnatural and dispreferred, and $^{?*}$ is grammatically questionable; the slash indicates two different speakers intuitions. Acceptability increases with a prosodically light pronoun (b.). In general, examples with the factative enclitic =V̄n are more accepted than with perfect =tē.

(10) Double-marking pattern interpretations (AUTHOR 201X:X)
    a. $^{?/?}$*Breno   **o**=síré=**ēn**   **o̠**=tá=ān
        Breno   **3SG.SET2**=run=**FAC**   **3SG.SET2**=go=**FAC**
        'Breno ran and went'
    b. $^{(?)/?}$Breno   **o̠**=vón   mé̠=**ēn**   **o**=yí=**īn**
        Breno   **3SG.SET2**=take   me=**FAC**   **3SG.SET2**=come=**FAC**
        'Breno brought me'

The interpretations of these examples contrasts with those in (9) where single-marking is strongly rejected as ungrammatical. Even for those speakers who may more readily accept a double-marking pattern here, it is the more marked variant of the two, reflected by its virtually non-existing status in the existing documentation work.

    Moreover, further consultation with a native speaker shows that he unequivocally rejects double-marking in single-marking context (11).

(11) Ungrammaticality of double-marking in the single-marking context
    a.   Ohoso   o̠=tá(***=n**)   (***o̠**=)ɖé=n   isen
        Ohoso   3SG.SET2=go(***=FAC**)   (***3SG.SET2**=)buy=FAC   fish
        'Ohoso went and bought fish' [ohk_201707xx]
    b.   Breno o=ɖúw   mé(***=n**)   (***o̠**=)tá=ān
        Breno 3SG.SET2=follow   me(***=FAC**)   (***3SG.SET2**=)go=FAC
        'Breno went with me' [ohk_201707xx]

Furthermore, for all speakers it is ungrammatical to have only one medial clitic in the single-marking context.

(12) Ungrammaticality of marking only one verb with double-marking
    a.   Ohoso   o=sóm   (***o**=)túl=n   óyi
        Ohoso   3SG.SET2=be.good   (***3SG.SET2**=)reach=FAC   him/her
        'Ohoso is as handsome as him.' (E.E. Kari p.c., 20XX XX XX)

b. Ohoso   o=yí(*=té)   kótú=té óyi
    Ohoso   3SG.SET2=come(*=PRF)   call=PRF   him/her
    'Ohoso has come and called him' (Kari 2003a: 285)

3.3. Syntax of SVCs

I adopt a modified version of Collins' (1997, 2002) analysis of SVCs involving nested vP shells where V_1 selects v_2P as its complement: $[_{\text{AspP}} \text{ASP}° [_{vP} v_1° [V_1° [_{vP} v_2° [V_2°]]]]]$. This vP complementation structure is illustrated in Figure 1.
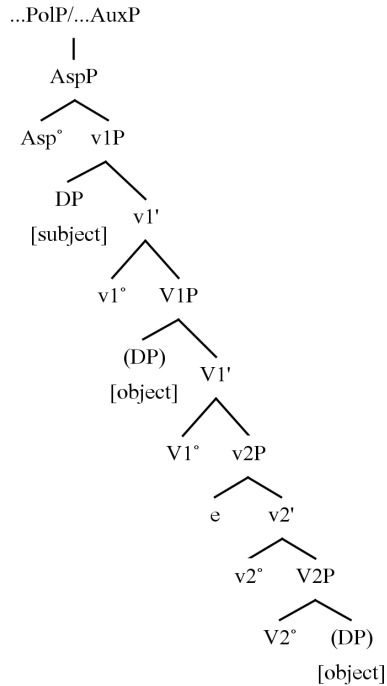

Figure 1: vP complementation structure: Asp > v_1 > V_1 > v_2 > V_2

In this structure, only one set of functional heads occur, i.e. a single Asp° head. The external argument (the subject) is base-generated in spec v_1P with a corresponding empty category e in spec v_2P (the latter's technical identity is outside the scope of this paper). Internal arguments (objects) are base-generated in positions within VPs.

Following Collins, in order to license multiple verbs under a single set of verbal projections which are not within coordinate or subordinate structures, Collins posits a *Serialization Parameter*, which states that a functional head I°/T° can license multiple Vs (Collins 1997: 493), and later modifies this as a little $v°$ able to license multiple Vs (Collins 2002: 8). In the version adopted here, I assume that the functional head Asp° (or the functional field as a whole) license multiple vPs. A similar structure is assumed in Carstens' (2002) analysis of Ijo SVCs.[7] Further, following much work in DM, I assume that the Agr features which are exposed as the subject agreement proclitics are inserted post-syntactically (Embick & Noyer 2007, Kramer 2010, Norris 2014, a.o.). Therefore, no agreement (Agr°) projections appear in the syntax which would correspond to the subject agreement proclitics.

I adopt that both the single-marking and the double-marking SVC clitic patterns have the syntactic structure in Figure 1, and argue that the differences between these patterns emerge only post-syntactically. There is no positive evidence that these different surface patterns involve distinct numeration types or distinct sets of syntactic operations. Both patterns involve the same types of functional categories, and both can be used with any type of

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[7] Several alternative proposals for SVC syntax exist. One involves double-headedness and parallel structure (Baker 1989, Hiraiwa & Bodomo 2008), in which an object is simultaneously an argument of both V_1 and V_2. Another involves VP adjunction where v_2P/V_2P is adjoined to the first verb projection (Baker & Stewart 2002). A third involves Aboh's (2009) proposal that in SVCs, V_1 is a functional projection while V_2 is a lexical projection. As the stated goal of this paper is to derive the distribution of the clitic patterns in SVCs post-syntactically, I do not present further arguments against these alternative structures, and maintain that whichever syntactic structure is chosen, it will be inadequate for accounting for the distribution of clitics in full.

lexical verb regardless of transitivity or other syntactic-semantic distinctions. To illustrate, the SVC ḍuw tạ 'go with' (lit. follow go) involves a transitive and intransitive verb. If the object of the transitive verb ḍuw 'follow' appears in-situ between the verbs, the double-marking pattern occurs as in (13)a. In contrast, if the object is moved e.g. under Ā-movement, the verbs become surface adjacent and the single-marking pattern occurs instead, shown in b.

(13) Syntax-equivalency of double-marking and single-marking (AUTHOR XX:XX)
    a. mi=ḍúw=**n**   **óvo**   **mị**=tá=an ?
        1SG.SET2=follow=**FAC who**   **1SG.SET2**=go=FAC
        'I went with who?'
    b. **ovó̱i** nú mi=ḍúw   ~~ovó̱i~~   tạ́=an?
        who   that 1SG.SET2=follow ~~who~~   go=FAC
        'who did I go with?'

Further, the number of verbs in the SVC also play no role in determining these patterns, as shown in (14) involving five verbs in series in a single-marking pattern.

(14) Ohoso **ọ**=tá   ḍẹ vọ́ yí   kíyé=**n** ọ́yi
     Ohoso **3SG.SET2**=go buy take come   give=**FAC** him/her
     'Ohoso went and bought (something) and brought (it) to him/her' (Kari 2004: 121)

I return to these facts below in Section 6.1 Alternative 1 – Syntactic verb movement.
    Finally, an important note needs to be made regarding aspect in SVCs. In the examples provided throughout, in the double-marking pattern the verbs share identical clitics, e.g. in (13)a above. However, in exactly one context the verbs bear different clitics. Recall that proclitics primarily expone subject agreement but the distribution of set 1 versus set 2 is conditioned by tense/aspect/polarity. In SVCs which express imperfective aspect (habitual or present continuous), the first verb is marked with a set 2 proclitic and the second verb is marked with a set 1 proclitic. This non-identical double-marking is found regardless of the presence of an intervening object.

(15) Obligatory non-identical proclitics in double-marking pattern expressing imperfective aspect
    a. tẹvúró tẹvuro   **ọ**=rékéréké   **mọ̄**=ḍí   á
        everyday   **3SG.SET2**=be.slow **3SG.SET1**=eat NPM
        'everyday, she eats (them) slowly' (AUTHOR 201X:XX)
    b. eni   **e**=ḍúw=n   ọ́yi   **mẹ́**=tá
        we   **1PL.SET2**=follow=FAC   him/her   **1PL.SET1**=go
        'we are going with him' (AUTHOR 201X:XX)
    c. Osoabo   **o**=kótú=n   ọ́yi **mọ́**=kpérí   ínúm
        Osoabo   **3SG.SET2**=call=FAC him **3SG.SET1**=tell something
        'Osoabo called (him and is) telling him something.' (Kari 2004: 113)
    d. Breno **ọ**=ḍí=n   íḍíyōm   **ọ**=vó   **mó**=réré   mú úsuweny
        Breno **3SG.SET2**=eat=FAC food   **3SG.SET2**=take **3SG.SET1**=walk   on   road
        'Breno is eating while working', 'Breno is eating and walking on the road' (Kari 2003a: 282)

In contrast, SVCs expressing perfective and perfect aspect or negative polarity use identical set 2 proclitics, while SVCs expressing future tense use identical set 1 proclitics, shown in (16). In mono-verbal clauses, both imperfective aspect and future tense are marked solely with a set 1 proclitic resulting in surface ambiguity between these tense/aspect distinctions.

(16) Future tense single- and double-marking with set 1 proclitics (AUTHOR 201X:XX)
    a. Breno **mó**=ḍúw   mé Ø   tạ́
        Breno **3SG.SET1**=follow   me Ø   go
        'Breno will go with me'
    b. eni   **mé**=ḍúw   ọ́yi **mẹ́**=tá
        we   **1PL.SET1**=follow   him **1PL.SET1**=go
        'we will go with him/her'

Given these facts about non-identical proclitics largely conditioned by distinct tense/aspect environments, it would be reasonable to assume that each verb in the SVC has a distinct Asp° projection, which can differentially condition the distinct proclitics.

(17) Asp-Serialization alternative with two Asp heads

$$[_{\text{Asp -1 P}} \cdots [_{v\text{-1 P}} \cdots [_{\text{V-1 P}} \cdots [_{\text{Asp -2 P}} \cdots [_{v\text{-2 P}} \cdots [_{\text{V-2 P}} \cdots]]]] \cdots$$

Despite this plausibility, I do not adopt this position. If there were two distinct Asp projections, we predict that the micro-events expressed by each verb could bear distinct aspectual values, e.g. 'he ate (then) and is coming (now)'. There is little if any evidence for this. For example, in (15) the [set 2=…set 1=…] structure together express imperfective aspect idiomatically, and cannot be decomposed into two independent aspect values whose sum expresses imperfective types habitual or present continuous. For those examples which do exist which are translated with multiple aspectual value (e.g. (15)c), they can easily be interpreted as a single imperfective aspectual value. Further, no instances of mixed enclitics occur (i.e. V_1 with $=\bar{V}n$ FAC and V_2 with $=te$ PRF), which are the primarily exponents of aspect. I assume that when the syntactic features expressing imperfective aspect appear in a SVC, these features are split across the verbs and result in the distinct exponents on the two verbs (set 2 and set 1 respectively). The exact mechanisms which derive this structure fall outside of the scope of this paper.

3.4. **Summary of distribution**

A summary of the complementary distribution of single-marking and double-marking is provided in Table 4.

V_1 ___ V_2	Double-marking		Single-marking	
Ø	?*~*	cl=[V_1]=cl cl=[V_2]=cl	√	cl=[V_1 V_2]=cl
Pron$_\sigma$	?~*	cl=[V_1 D$_\sigma$]=cl cl=[V_2]=cl	√	cl=[V_1 D$_\sigma$ V_2]=cl
Pron$_{\sigma\sigma}$	√	cl=[V_1]=cl D$_{\sigma\sigma}$ cl=[V_2]=cl	*	cl=[V_1 D$_{\sigma\sigma}$ V_2]=cl
DP	√	cl=[V_1]=cl **DP** cl=[V_2]=cl	*	cl=[V_1 **DP** V_2]=cl

Table 4: Complementary distribution of clitic marking in SVCs

4. DM analysis: A first pass

The distribution of clitics in SVCs can be summarized as a list of licit and illicit structures, shown in Table 5.

Licit structures	Illicit structures					
√ cl=[V]=cl	*	cl=[V] Ø	*	Ø [V]=cl	*	Ø [V] Ø
√ cl=[V D$_\sigma$]=cl	*	cl=[V D$_\sigma$] Ø	*	Ø [V D$_\sigma$]=cl	*	Ø [V D$_\sigma$] Ø
√ cl=[V_1 V_2]=cl	*	cl=[V_1 V_2] Ø	*	Ø [V_1 V_2]=cl	*	cl=[V_1]=cl Ø [V_2] Ø
√ cl=[V_1 D$_\sigma$ V_2]=cl	*	cl=[V_1 D$_\sigma$ V_2] Ø	*	Ø [V_1 D$_\sigma$ V_2]=cl	*	cl=[V_1 D$_\sigma$] Ø cl=[V_2]=cl
√ cl=[V_1]=cl D$_{\sigma\sigma}$ cl=[V_2]=cl	*	cl=[V_1] Ø D$_{\sigma\sigma}$ cl=[V_2]=cl	*	cl=[V_1]=cl D$_{\sigma\sigma}$ Ø [V_2]=cl	*	etc.

Table 5: Licit and illicit SVC clitic patterns

The central generalization is that all verbs in the licit structures appear in a verbal constituent which is marked by a proclitic and an enclitic (note that enclitics are present only when the morphosyntactic features which they expone are present, i.e. factative and perfect but not future). In comparison, all verbs in the illicit structures appear in a constituent which is not fully marked by these inflectional clitics.

We understand these data as demonstrating a **morphological conspiracy** in the sense that all surface structures exhibit verbs or verb complexes which are marked with a full set of clitics, i.e. a structure which converges on a structure CL=[$_V$]=CL. We can understand this structure as adhering to a **morphological well-formedness condition** which can be formalized as a markedness constraint V=WF(INFL) which states that verbs must appear with appropriate inflection.

The constraint V=WF(INFL) results in a number of independent post-syntactic operations, hence the conspiracy. First, it triggers insertion of subject agreement AGR nodes not present in the syntax, exponed as the proclitics. Second, the aspectual enclitics exponing the functional Asp° head is moved to the verb where it right-attaches. Third, if there is an intervening prosodically heavy object the aspectual enclitic is both lowered onto V_1 and copies onto V_2. Fourth, the fact that adjacent verbs or verbs whose intervening object is prosodically light appear with single marking suggests that they form a constituent at some level of representation. If we accept that these verbs do *not* form a constituent in the syntax (i.e. no v_1-to-v_2 syntactic head movement), then constituent

formation must take place via a post-syntactic operation, i.e. (V₁) (V₂) > (V₁+V₂). Informally speaking, if the verbs are sufficiently local defined prosodically, they may form a constituent to 'share' the clitic marking resulting in single-marking. If however they are not sufficiently local, each verb receives its own set resulting in double-marking. This is summarized below.

(18) Morphological conspiracy triggered by V=WF(INFL)
    a.   Insertion of subject agreement AGR nodes
    b.   Lowering of aspectual enclitic to V₁
    c.   Copying of aspectual enclitic to V₂
    d.   Constituency formation of sufficiently local verbs

This conspiracy is characteristic of morphological well-formedness conditions as discussed in the literature, e.g. Halle & Marantz' (1993: 137) account of English tense morphology requiring a verb for well-formedness.

By definition, DM operations are due to morphological requirements, though they are often not framed as triggered by formal markedness constraints. Two such operations are **dissociated node insertion (DNI)** and **local dislocation (LD)**, which can be used to model the Degema morphological processes sketched above.

4.1. **Dissociated Node Insertion (DNI)**

Embick & Noyer (2007: 305-310) discuss the insertion of dissociated material at spell-out, which they understand as two types: dissociated feature insertion and dissociated node insertion (i.e. bundles of features on a separate morphological node). For the purposes of this paper, I treat them together and refer to them as dissociated node insertion (DNI). DNI is used to capture what Embick & Noyer call **ornamental morphology**, exemplified with Latin thematic vowels and agreement morphemes (glossed TH and AGR, boldened). Such ornamental morphology is inserted post-syntactically and therefore does not expone syntactic terminal nodes.

(19) Latin insertion of ornamental morphology
    laud-**ā**-bā-**mus**
    root-**TH**-TNS-**AGR**
    'We were praising'

DNI of agreement morphology relies on a concept of **feature copying** where a feature 'present on a node *X* in the narrow syntax is copied onto another node *Y* at PF' (Embick & Noyer 2007: 309). The exact mechanisms which underlie the agreement patterns are outside of the scope of this paper however (e.g. *Agree-Link* vs. *Agree-Copy* – Arregi & Nevins 2012:86). Post-syntactic insertion of morphological nodes has been well-supported in the DM/Minimalist literature (Embick & Noyer 2007, Kramer 2010, Norris 2014, a.o.).

With respect to the Degema data, subject agreement proclitics and the second aspectual enclitic on V2 are inserted via DNI, resulting in structures which comply with the V=WF(INFL) constraint. These proclitics appearing in both single- and double-marking are the exponents of feature bundles which are copies of subject PHI-features. Example (20) below repeats ex. (9)a above, involving third person singular proper name subject *Tatane* and the verbs *kotu* 'call' and *kpẹri* 'tell'. DNI also accounts for the presence of a second aspect marker in the double-marking pattern. In this pattern, the first aspectual enclitic on V1 is the exponent of the syntactic Asp° head while the second enclitic on V2 is a dissociated aspectual agreement node. Both of these share the same features and consequently are both exponed by the same vocabulary items. In the example, agreement nodes inserted via DNI are boldened.

(20) DNI of subject agreement in Degema
    a.   Input: [$_{AspP}$ Subject$_i$ [Asp° [$_{v1P}$ ~~Subject$_i$~~ [$v_1°+V_1°$ … [$v_2°+V_2°$ …
                Tatane   √PRF $v_1°$+√KOTU   … $v_2°$+√KPẸRI
                   | | | |
    b.   Output: /Subject/ /PRF/   /**AGR$_{SBJ}$**/+/Verb₁/   /**AGR$_{SBJ}$**/+/Verb₂/+/**AGR$_{ASP}$**/
                    /Tatane/ /=te/   /**o**=/+/kotu/   /**ọ**=/+/kperi/+/=**te**/

This aspectual concord is directly parallel with Kramer's (2010) analysis of Amharic definiteness marking. In (21) below, Kramer argues that the first instance of the definite marker –*u* is the exponent of D° (and appears right-adjacent via local dislocation), whereas the second –*u* is the exponent of a post-syntactic Agr node insertion valued through copy featuring (this latter exponent is optional).

(21) Amharic definiteness concord – Dissociated Node Insertion of DEF node
    tillik'-**u**   t'ik'ur(**-u**)   bet
    big-**DEF**   black(-**DEF**)   house
    'the big black house' (Kramer 2010: 229)

In both the Amharaic and Degema cases, surface identical morphemes correspond to features which originate in distinct modules in the derivation.

4.2. **Local Dislocation (LD)**

The DM operation local dislocation (LD) takes two linearly adjacent constituents (α)*(β) and converts them into a single constituent with or without linear changes, i.e. (α+β) ~ (β+α) (Embick & Noyer 2001: 561). After LD, morphemes which would otherwise be expected to be independent words on syntactic criteria (i.e. expone syntactic terminal heads) are converted into having an affixal relationship. Several accounts employ LD to account for the position of clitics, e.g. in (22) the Latin conjunct clitic =*que* local-dislocates and attaches to the right edge of the first word of the second conjunct.

(22) Local dislocation with Latin =*que*
    …(**que**)*(barbaris)… → …(barbaris+**que**)…
    [barbaris   **=que**   equitibus   paucis]
    barbarian.ABL.PL=**and**   cavalry.ABL.PL few.ABL.PL
    '…**and** a few barbarian cavalry-men' (Embick 2007b)

LD operates on linear order and is therefore distinct from the DM operation *Lowering* which is sensitive to syntactic hierarchical structure rather than linear order.

   LD can account for several effects of the Degema clitic patterns, illustrated in (23). First, in those structures which appear with aspectual enclitics, these enclitics local-dislocate and right-attach to the adjacent verb; as shown above the enclitics appear in a higher syntactic Asp° position.[8] Second, as shown in ex. (6) and throughout, prosodically light object pronouns are the only morphemes which intervene between the verb and the enclitic. Here, the light pronoun local-dislocates with the preceding verb, though without any linear order changes. LD takes place here due to the pronoun being prosodically deficient and unable to form a relevant constituent on its own. Third, if two verbs appear surface adjacent they undergo LD and form a single constituent, i.e. a morphological verb compound. Because LD is sensitive to linear rather than hierarchical structure, this captures the fact that any sequence of adjacent verbs undergoes LD even those in which a syntactic object has been Ā-moved or is covert (as shown in (13)-(14) above involving *wh* Ā-movement).

(23) Local dislocation in Degema
    a.   (/**asp**/)*(/V/)   →   (/V+asp/)   (/=**n**/)*(/som/) →   (/som+**n**/)   [Ex. (7)a]
    b.   (/V/)*(/D_σ/)   →   (/V+D_σ/)   (/tul/)*(/**wọ**/) →   (/tul+**wọ**/)   [Ex. (7)a]
    c.   (/V_1/)*(/V_2/)   →   (/V_1+V_2/)   (/som/)*(/**tul**/) →   (/som+**tul**/)   [Ex. (7)b]

If more than one morpheme appears which is applicable, LD takes place iteratively, shown below.

(24) Iterative local dislocation in Degema
    a.   (/asp/)*(/V/)*(/D_σ/)   →   (/V/+/D_σ/+/asp/)
         (/=te/)*(/gidi/)*(/ḅaw/)   →   (/gidi/+/ḅaw/+/te/)   [Ex. (6)c]
    b.   (/asp/)*(/V_1/)*(/D_σ/)*(/V_2/) →   (/V_1/+/D_σ/+/V_2/+/asp/)
         (/=n/)*(/ḍuw/)*(/me/)*(/tạ/) →   (/ḍuw/+/me/+/tạ/+/n/)   [Ex. (8)b]

LD is therefore used to account for the fact that certain verb clusters and verb+pronoun clusters have the same distribution as single verbs with respect to inflectional morphology, as they each form a morphological constituent. Thus, Degema exhibits two types of local dislocation: prosodically driven LD for (V)*(D_σ) sequences, and morphologically driven LD for (V1)*(V2) sequences. If a verb can locally dislocate to satisfy this condition, it does

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[8] Verb movement to Asp° is ruled out because this would predict that in SVCs the aspectual enclitic should always appear between V1 and V2, contrary to fact.

so, avoiding the need for unnecessary dissociated node insertion. In this way, the double-marking pattern represents a 'repair' when a single-marking pattern is not possible.[9]

4.3. Support for (V₁+V₂) morphological constituency: Evidence from tone

Support for the morphological constituency of verb clusters comes from grammatical tone. Degema contrasts /H/ vs. /L/ tone, as well as downstepped /H/s (downstepped Hs are transcribed as [⁺H] and in orthography with a macron e.g. <ā>). Tone on verbs is predictable from grammatical context. In both the factative and the perfect aspect, a grammatical H tone is assigned to the verb, book-ended by a set 2 agreement proclitic with low tone and the aspectual enclitic =V̄n or =tē , as in (25)a. The final downstepped H associated with the enclitic only surfaces if it is followed by all high tones b., or is at the end of a phonological phrase (c.).

(25) Grammatical all High tone between clitics
    a.   mi̠=(ḍé)=n   ágada
        1SG.SET2=**buy**=FAC   chair
        'I bought a chair' (E.E. Kari, p.c. XXX)
    b.   Tatane   o=(**kótú**)=té   éni   o̠=(**kpérí**)=tē   ínúm
        Tatane   3SG.SET2=**call**=PRF   us   3SG.SET2=**tell**=PRF something
        'Tatane has called us and told (us) something' (Kari 2003a: 285)
    c.   o=(**kótú**   **wó̠**)=ōn
        3SG.SET2=**call**   **you**=FAC
        '(s)he called you' (Kari 2004: 276)

Crucially, in the single-marking SVC all verbs and prosodically light object pronouns between the clitics are marked with H tone as well, as in (26). Unlike verbs, objects such as /isen/ [ìsèn] ([ìsén] in isolation) in b. and subjects such as Ohoso /óhósò/ in c. fall outside of this grammatical H tone.

(26) Grammatical all High tone marking between clitics in a SVC
    a.   Breno o=(**ḍúw**   **mé**   **tá̠**)=ān
        Breno 3SG.SET2=**follow**   **me**   **go**=FAC
        'Breno went with me' (Kari 2004: 115)
    b.   o̠=(**tá**   **ḍé̠**)=n   isen
        3SG.SET2=**go**   **buy**=FAC   fish
        '(s)he went and bought fish' (Kari 2004: 311)
    c.   Ohoso   o̠=(**tá**   **ḍé̠** **vó̠** **yí**   **kí̠yé**)=n   ó̠yi
        Ohoso   3SG.SET2=**go**   **buy** **take** **come**   **give**=FAC her/him
        'Ohoso went and bought (something) and brought (it) to her/her' (Kari 2004: 121)

The facts with future tense are similar. This tense/aspect is marked via a set 1 proclitic but no enclitic, and all verbs are marked with grammatical H tone. In the factative and perfect in (25)-(26) above the set 2 proclitic was marked

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[9] In the DM literature, LD most commonly occurs with functional material and not two lexical morphemes such as verbs. However, there is precedence for post-syntactic V+V cluster formation from Germanic. Salzmann (2013) demonstrates that with Swiss German verbs which appear with verb phrase complements, the verb phrase complement is by default linearized to the right, unlike DPs which are linearized to the left (p. 91). However, at the surface level, the selecting verb which is morphosyntactically highest appears at the right edge of a verb cluster, the so called 123 → 231 verb cluster change, shown below:

(i)   Verb cluster formation in Swiss German
     …**laat_{V1}**…[la_{V2}…[gaa_{V3}…] → …[[la_{V2}=gaa_{V3}]+**laat_{V1}**]
     das   er   si   la₂   gaa₃   **laat₁**
     that he   her let.PARTICLE go.INF   **let.3SG**
     'that he lets her go' (Salzmann 2013: 89)

Salzmann argues that "verb cluster formation + inversion is a late PF-process akin to Local Dislocation" (p. 90), and that to account the cluster formation via syntactic head-movement would result in a number of problems such as not making the correct predictions regarding cluster impenetrability facts (p. 114).

with L tone. In the future tense/aspect below, the set 1 proclitic is marked with H tone with the exception that the proclitic *me=* 1sg.set1 is always marked with /L/ tone.

(27) Grammatical /H/ tone with future tense/aspect
    a. me=(**yí**)   ḅána   úkpé   vivi
        1SG.SET1=**come** here   year   another
        'I will come here another year/next year' (Kari 2004: 230)
    b. mọ́=(**vón**)   íva   ḅáaw   mọ́=(**vó**   **yọ́kúró**)
        3SG.SET1=**take** two   them   3SG.SET1=**take leave**
        '(s)he will leave with both of them', '(s)he will take two of them and leave' [ohk_20170806]

Example b. demonstrates that all verbs within the SVC are marked with H tone.

    We can contrast the behavior of verbs in SVCs with that of transitive verbs with overt object nouns. Nouns have lexical contrast as well as being subject to grammatical tone changes. Nearly half of all Degema nouns surface with a [LⁿH] tone pattern in isolation (~45%), which is the default tone pattern in the language also found on verbs in isolation. Given that this pattern can be predicted from default rules, I analyze such nouns as inherently toneless, i.e. /Ø/. Other nouns show a restricted number of lexical patterns, all of which must contain at least one lexical /H/ tone. Data in (28)a-b demonstrate that in a SVC where the last verb is three syllables long e.g. *yọkuro* 'leave', the /H/ tone spreads across it to the end of the domain, resulting in a consistent all H pattern across the SVC. In contrast, the data in (c.) show that when the SVC is followed by a three syllable toneless *noun* /ạgada/ 'chair', the /H/ tone does not spread to the end. The noun surfaces as [ạ́gàdà], with a /H/ assigned to the initial syllable of the object.[10]

(28) Tonal differences in future tense/aspect: Verbs vs. objects
    a. Tense/aspect H tone spread across toneless constituent ($V_1+V_2+V_3$)
        mọ́=(vón   vó **yọ́kúró**)   **[… jɔ́kɔ́rɔ́]**   (cf. *...yọ́kuro *[jɔ́kòrɔ̀])
        3SG.SET1=take   take **leave**
        '(s)he will take (it) and leave', '(s)he will leave with (it)' [ohk_20170806]
    b. Tense/aspect H tone spread across toneless constituent ($V_1+O_\sigma+V_2$)
        Bréno mọ́=(ḍúw   mé **yọ́kúró**)   **[… jɔ́kɔ́rɔ́]**   (cf. *...yọ́kuro *[jɔ́kòrɔ̀])
        Breno 3SG.SET1=follow   me **leave**
        'Breno will leave with me' [ohk_20170806]
    c. Tense/aspect H tone spread across toneless constituent (V_1+V_2) to exclusion of following toneless (O)
        Bréno mọ́=(tá   gén)   (**ạ́gada**)   **[… ạ́gàdà]**   (cf. *...ạ́gádá *[ạ́gádá])
        Breno 3SG.SET1=go   look.at   **chair**
        'Breno will look at a chair' [ohk_20170806]

    Finally, negation is expressed via a /H/ tone on a type 2 proclitic and an all /L/ pattern on the verb. No aspectual enclitics occur and the distinction between perfective, perfect, imperfective, and future is collapsed.

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[10] There is a complication with the assignment of grammatical tone: when the last verb appears with a two syllable toneless object and this object appears last in the phonological phrase, the second verb is downstepped. This is unexpected given that no downstepped H is present when an object is not present (ii), and because the downstepped H appears between the verbs. [The superscript ˣ here indicates not attested.]

(ii) mọ́=(**tá**   **gḕn**)   ẹ́nám   [mɔ́ tá ꜜgén ɛ́nám]   (Cf. ˣ[mɔ́ tá gén ɛ́nám] ˣ[mɔ́ tá gɛ́n ꜜɛ́nám]
      3SG.SET1=**go**   **look.at**   animal   ˣ[mɔ́ ꜜtá gɛ́n ɛ́nám])
    '(s)he will go look at an animal' [ohk_20170806]

As mentioned above, downstepped Hs only surfaces if they appear following all high tones or they are at the end of a phonological phrase.

    A partial answer to this unexpected data involves restrictions in the tonal grammar of Degema. Of a corpus of Degema nouns from Kari's (2008) dictionary, there are downstepped surface patterns [HꜜH], [HꜜHH], [HꜜHHH], [LHꜜH], [LHHꜜH], [LHꜜHH], [HLHꜜH], and [LLHꜜH], but there are no patterns ˣ[(L)HHꜜHH] where the word has two H tones followed by a downstepped H-H sequence. I therefore suspect that phonological markedness constraints affect the distribution of grammatical H tone with future tense/aspect.

(29) Grammatical /L/ tone expressing negation

    a. mée mị=tá=an   dọ mée mí=(**mon**)   ọ́yi   […mí **mɔ̀n** ɔ́jì]

       I   1SG.SET2=go=FAC   but I   NEG\1SG.SET2=**see**   her/him

       'I went but I didn't see her/him' (Kari 2004: 138)

    b. mí=(**seneke**)   mú ívom

       NEG\1SG.SET2=**think** in inside

       'I don't think so' (Kari 2004: 32)

As with grammatical tone above, the /L/ tone spreads across the entire SVC constituent.

(30)

    a. ọsamá yọ ọ́=(**buw**   **kel**   **me**)   […ɔ́ bòw kèl mè]

       shirt the NEG\3SG.SET2=**be.big**   **be.more.than** **me**

       'the shirt is not bigger than me' [i.e. not oversized] (Kari 2004: 155)

    b. ó=(**ḍeri**   **me**) ká̩buló ó=(**meme**   **ḍị**) íḍíyóm yọ

       NEG\3SG.SET2=**know me** because NEG\3SG=**agree   eat** food the

       '(s)he refused to eat the food because (s)he doesn't know me' (Kari 2004: 45)

    c. Ohoso ọ́=(**kotu**   **me kake**)   inum

       Ohoso NEG\3SG.SET2=**call me show**   something

       'Ohoso did not call me and (did not) show (me) something' (Kari 2003a: 278)

Parallel to the examples in (28), if the negative SVC is followed by a three-syllable toneless object, for some speakers the noun bears an initial /H/ tone (a.). For other speakers, inherently toneless objects remain toneless under negation regardless of syllable count and bear all /L/ tones on the surface b. (the [%] indicates inter-speaker variability).

(31)

    a. [%]Breno   ó=(meme   mene)   **úmene**

       Breno   NEG\3SG.SET2=agree do   **work**

       'Breno refused to work' (Kari 2004: 117)

    b. [%]Breno   ó=(meme   mene)   **umene**   [ohk_20170806]

In contrast, when the verbs in the SVC are separated by a prosodically heavy object resulting in double-marking, only V1 bears negation tone and does not spread across the intervening object, shown below. Any subsequent verbs are marked with /H/ tone and a set 2 proclitic bearing /L/ tone (no enclitics occur here, as well). Although negation tone is marked on only V1, negation takes scope over both verbs (Kari 2004: 111).

(32)

    a. Ohoso   **ó=(kotu)**   éni **ọ=(káké)**   ínúm

       Ohoso   **NEG\3SG.SET2=call** us **3SG.SET2=show**   something

       'Ohoso did not call us and show (us) something' (Kari 2003a: 279)

    b. Osoabo   **ọ́=(von)**   élege **ọ=(fíyá)**

       Osoabo   **NEG\3SG.SET2=take** knife **3SG.SET2=cut**

       'Osoabo did not use a knife to cut something' (Kari 2004: 111)

       (*Not* 'Osoabo cut something but didn't use a knife (to do it)')

    c. Cf. Ungrammatical 'doubling' of negation tone

       *Osoabo   **ọ́=(von)**   élege **ọ́=(fiya)**

This example illustrates that V2 can only bear grammatical tone expressing negation only when it is sufficiently local to V1, which supports cross-module constituency of these verbal sequences.[11]

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[11] Another set of complications for grammatical tone and morphological constituency comes from Degema auxiliaries. Auxiliary verbs are a closed class with 12 members which appear between the subject and lexical verb, consisting of: *nwạnyki* 'intended to', *mạnyki(ma)* 'shouldn't', *mạ₁* 'would have', *kụ* 'did' (verum focus), *ḅuka(ma)* 'begin', *mạ₂* 'not yet', *ḍạ₁* 'then', *sị₁* 'had finished', *kịri/kụru* 'again, also', *ḍạ₂* 'about to', *sị₂/sụ* 'still', and *gạ* 'actually'. Generally speaking, auxiliary constructions show properties which can be subsumed under serial verb

4.4. **Problems with Rules & Constraint DM**

The DM operations Dissociated Node Insertion (DNI) and Local Dislocation (LD) have been used to account for morphological adjustments necessary to comply with the morphological markedness constraint V=WF(INFL). In sections 2.3-2.4, we contrasted two sub-theories Rules & Constraints DM (R&C DM) and Optimality Theoretic DM (OT-DM) which treat DM operations in fundamentally different ways. In this section, I discuss an analysis of the Degema data within R&C DM and show why this is inadequate for capturing the facts.

Under the R&C DM approach, DM operations are input-to-output rules which are ordered and apply in serial. If we call such a rule computation K following Embick (2010), then the grammar will 'apply computation K when the structural description of K is met' (p 40) (also the principle of 'Rules Apply' - Bobaljik 2017). Under R&C DM, constraints may exist as inviolable filters which can trigger a rule to repair illicit structures, e.g. the constraint T-NONINITIALITY in Basque triggering a number of repairs discussed on pg. 3. Extended to Degema, we would state that the operations DNI and LD are repairs to satisfy an analogous filter.

There are two main arguments against this view. First, a conceptual one is the **duplication** argument, common in debates of rules versus constraints. This states that if constraints are necessary in a derivation, and if constraints can derive the patterns that rules can, then rules only serve to duplicate derivational mechanisms and are therefore superfluous. Second, an argument particular to the Degema data involves the inadequacy of rule ordering in accounting for the data. As most work in DM is rule/R&C based, it is critical to establish the order of operations. It is frequently claimed or assumed that feature copying/dissociated node insertion takes place before vocabulary insertion (VI), which takes place before local dislocation (Embick & Noyer 2001, 2007; Embick 2007b). The common evidence justifying this ordering involves bleeding and feeding relations, e.g. in the Latin *=que* example in (22) above, the phonological properties of the VI inserted after *=que* will affect its LD pattern.

(33) Embick & Noyer (2001) - DM order of operations
    DNI > VI > LD

This order of operations predicts the wrong patterns in Degema. Both the single-marking and the double-marking SVC patterns derive from the same syntactic structure, and therefore the only difference in their post-syntactic inputs is the absence vs. presence of an overt intervening DP object. This is shown in the tables below using the double-marking context *mi=ḍúw=n ọ́yi mị=tá=ān* 'I went with her/him' (from (8) above), versus the single-marking *Ohoso ọ=tá Ø ḍé=n isen* 'Ohoso went and bought fish' with no intervening object (from (11) above). Table 6 illustrates that the standard rule order correctly predicts the attested surface form.

Syntax	$[_{ASPP}\ ASP°\ [_{v1P}\ v_1°+V_1°\ [\ DP\ \cancel{V_1}°\ [_{v2P}\ v_2°+V_2°\ [\ \cancel{V_2}°\ ]\ ]\ ]\ ]\ ]$
DNI	$(asp°)\ (agr_{sbj}+v_1°+V_1°)\ (DP)\ (agr_{sbj}+v_2°+V_2°+agr_{asp})$
VI	(n)*(mi+ḍuw)*(ọyi)*(mị+ta+n)
LD	(mi+ḍuw+*n*)*(ọyi)*(mị+ta+n)
Predicted: mi=ḍuw=n ọyi mị=ta=n ☺ Attested: mi=ḍuw=n ọyi mị=ta=n	

Table 6: Correct prediction in double-marking context with intervening DP object

In contrast, the single-marking table illustrates that this rule order does not correctly predict the attested surface form. Here, because DNI applies first, both sets of clitics receive full agreement marking. This is then the input for VI which inserts proclitics and enclitics on both sets of verbs, followed by LD which dislocates the initial enclitic. The result is an incorrect form *ọ=ta=n ọ=ḍe=n.

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constructions with respect to the distribution of clitics. If an auxiliary and verb are surface adjacent, then the proclitic falls only on the auxiliary (with the exception of obligatory double-marking expressing imperfective aspect, example (15) on p. 10).

However, the first four auxiliaries listed above *nwạnyki*, *mạnyki(ma)*, *mạ₁*, and *kụ* have unexpected tonal effects which I do not account for at present. For example, *mị=**má₁** ḍuw wọ tạ́* 'I would've followed you (but didn't)' with auxiliary *mạ₁* 'would have' appears with a SVC and together bear a [HLH] tonal melody. I adopt a working hypothesis that auxiliaries are subject to the same grammar as SVCs involving local dislocation and dissociated node insertion, but trigger distinct tonal melodies compared to lexical verbs. Discussion of Degema auxiliaries is found on: Kari (2003b:40-50,121,170,209), Kari (2004:25,30,35-38,68,77,132,160-163,234,278,284-291,295,302,347), and Kari (2005b).

Syntax	$[_{\text{ASPP}}$ ASP° $[_{v\text{P}}$ $v_1°$+V$_1°$ [Ø V̶$_1°$ $[_{v\text{P}}$ $v_2°$+V$_2°$ [V̶$_2°$]]]]]
DNI	(asp°) (agr$_{\text{sbj}}$+$v_1°$+V$_1°$) (agr$_{\text{sbj}}$+$v_2°$+V$_2°$+agr$_{\text{asp}}$)
VI	(n)*(ọ+ta)*(ọ+dẹ+n)
LD	(ọ+ta+*n*) (ọ+dẹ+n)
☙ Predicted:	*ọ=ta=n ọ=dẹ=n ☹ Attested: ọ=ta dẹ=n

Table 7: Incorrect prediction in single-marking context with standard rule order

Here, because DNI and VI take place before LD, this bleeds the application of LD. Keeping standard DM rule order results in an **ordering paradox**.

Within an R&C DM model, the only adequate rule order is therefore VI > LD > DNI. Here, VI would feed LD given that an object pronoun undergoes LD and forms a constituent with the verb depending on whether it is prosodically light or heavy (recall from Table 3 p. 7 that prosodically light pronouns do not form a natural morphosyntactic class). Further, LD would bleed DNI given that adjacent verbs show single-marking rather than double-marking.

Syntax	$[_{\text{ASPP}}$ ASP° $[_{v\text{P}}$ $v_1°$+V$_1°$ [Ø V̶$_1°$ $[_{v\text{P}}$ $v_2°$+V$_2°$ [V̶$_2°$]]]]]
VI	(n)*(ta)*(dẹ)
LD	(ta+*dẹ*+*n*)
DNI	(ọ+ta+dẹ+*n*)
Predicted:	ọ=ta dẹ=n ☺ Attested: ọ=ta dẹ=n

Table 8: R&C Analysis - Correct prediction with order VI > LD > DNI

Even if we allow for parametric variation in DM rule order, there is a more serious issue with this analysis. Under R&C DM, constraints trigger repairs which manifest as DM operations. The constraint we have established for Degema is V=WF(INFL) which states that all verbs are well-formed with respect to verbal inflection. In Table 8 above, DNI can be understood as repairing this constraint by inserting the proclitic exponing subject phi-features. In contrast, it is not apparent how LD would be a repair for this constraint. In this table, the verbs and the factative enclitic =*n* undergo LD. At first glance we might say that the verbs undergo LD with each other in order to form a constituent marked with aspectual inflection, thereby satisfying V=WF(INFL). However, such LD between verbs takes place even in the absence of an enclitic. Recall that future tense/aspect is marked by a set 1 proclitic, H tone, and no enclitic, repeated below.

(34) mọ́=**tá**   (*mọ́=)**gē̄n**   énám
      3SG.SET1=**go**   (*3SG.SET1=)**look.at**   animal
      '(s)he will go look at an animal' [ohk_20170806]

If the verbs are adjacent, only the single-marking pattern is permitted, which would be derived via LD. However, at the stage that VI and LD apply, there are no overt clitics present. It would therefore not be possible to motivate LD as a repair for V=WF(INFL) as it takes place *prior* to DNI. This is illustrated below.

Syntax	$[_{\text{ASPP}}$ ASP° $[_{v\text{P}}$ $v_1°$+V$_1°$ [Ø V̶$_1°$ $[_{v\text{P}}$ $v_2°$+V$_2°$ [V̶$_2°$]]]]]
VI	Ø*(ta)*(dẹ)
LD	(ta+*dẹ*) ← Unclear motivation
DNI	(mọ+ta+dẹ)
Attested:	mọ=ta dẹ

Table 9: R&C Analysis – Unclear motivation for LD in the absence of inflectional exponents

Under a strict interpretation of V=WF(INFL), LD should not be licensed here and we therefore expect a double-marking pattern, contrary to fact. LD would therefore apply in effect in preparation for DNI, a classic **'look-ahead' problem** found in rule-based serial derivations. Although it is possible to attribute LD to being an independent rule unrelated to the constraint V=WF(INFL), this would fully undermine the morphological conspiracy itself which sought to unify verb LD and agreement DNI (see similar arguments laid out in Foley *to appear* for Georgian).

5. OT-DM: In support of a hybrid model

I account for the Degema morphological conspiracy within an OT-DM model. In the view espoused here, DM morphological operations DNI and LD are deconstructed into a series of constraints. The verb inflection requirement in Degema is enforced via a set of highly-ranked morphological markedness constraints requiring a particular output shape and type, which are ranked higher than other constraints. Markedness constraints are counterweighted by mapping constraints which enforce particular mappings between input and output structure, and other faithfulness and markedness constraints. This is schematized in Tableau 1 below, involving the three main input types: SVCs with no object / V_1 V_2 /, SVCs with a prosodically light object / V_1 D_σ V_2 /, and SVCs with a prosodically heavy object / V_1 $D_{\sigma\sigma}$ V_2 /. These inputs all have the potential to map to verbal structures without any clitic marking ('None'), structures with single-marking ('Single'), and structures with double-marking ('Double').

I:		/ V_1 V_2 /		Mark Set 1	Map Set 1	Faith	Map Set 2
O_1:		None	V_1 V_2	1 !			
O_2:	☞	**Single**	**cl=[V_1 V_2]=cl**			1	4
O_3:		Double	cl=[V_1]=cl cl=[V_2]=cl			3 !	2
I:		/ V_1 D_σ V_2 /		Mark Set 1	Map Set 1	Faith	Map Set 2
O_1:		None	V_1 D_σ V_2	1 !			
O_2:	☞	**Single**	**cl=[V_1 D_σ V_2]=cl**			1	6
O_3:		Double	cl=[V_1 D_σ]=cl cl=[V_2]=cl			3 !	4
I:		/ V_1 $D_{\sigma\sigma}$ V_2 /		Mark Set 1	Map Set 1	Faith	Map Set 2
O_1:		None	V_1 $D_{\sigma\sigma}$ V_2	1 !			
O_2:		Single 1	cl=[V_1 $D_{\sigma\sigma}$ V_2]=cl	1 !		1	6
O_3:		Single 2	cl=[V_1 V_2]=cl $D_{\sigma\sigma}$		2 !	1	4
O_4:	☞	**Double**	**cl=[V_1]=cl $D_{\sigma\sigma}$ cl=[V_2]=cl**			3	2

Tableau 1: Emergence of single and double-marking patterns (numbers = number of violations)

The no clitic marking pattern for all inputs is eliminated because it violates the highly ranked markedness constraint. Single-marking surfaces in the / V_1 V_2 / and / V_1 D_σ V_2 / contexts over double-marking. Here, neither the single-marking or double-marking candidate violates the highly ranked markedness or mapping constraints – Mark Set 1 and Map Set 1 – but the double-marking candidate incurs more violations of the Faith set than the single-marking candidate and is thus eliminated. In contrast, double-marking in the / V_1 $D_{\sigma\sigma}$ V_2 / context surfaces over two potential single-marking outputs: \ cl=[V_1 $D_{\sigma\sigma}$ V_2]=cl \ with pronoun integration and \ cl=[V_1 V_2]=cl $D_{\sigma\sigma}$ \ with V dislocation over the pronoun. The first single-making candidate incurs a fatal violation of a constraint in Marked Set 1 and is thus eliminated, while the second single-marking candidate incurs a fatal violation from Map Set 1. For all derivations, the single-marking candidates have more violations of Map 2 constraints than the double-marking, but because Map 2 constraints are dominated they are rendered inert.

Non-formally, single-marking is preferred overall as it inserts the least number of dissociated nodes and therefore incurs the least markedness violations. However, a consequence of single-marking is local dislocation of V_2. If this LD operation resulting from single-marking is too costly, then double-marking results as a secondary 'repair', ensuring verbs are marked with appropriate inflection. I formalize and exemplify this central insight below. See also Appendix 2, where I illustrate a **factorial typology** using the proposed constraint set.

5.1. The constraint set

The constraint set I adopt is in Table 10 on p. 21. These are split into three constraint-strata (C-Strata) separated by solid lines, within which are sets of constraints separated by a dotted line. C-Strata are crucially ordered and must appear in the order provided. The constraints within each C-Stratum are not crucially ordered, but grouped together based on their type. There are four different types of constraints. Faithfulness (Faith) and mapping (Map) constraints are evaluated by comparing the input structure to an output candidate. Markedness (Mark) and alignment (Align) constraints solely evaluate output candidates without reference to the input.

Within C-Stratum 1, the first constraint set Mark 1 is composed of a series of markedness constraints 1-7. Constraints 1-3 V=WF_MWD(AGR_SBJ), V=WF_MWD(asp), and V1>V2 enforce inflection on morphological words. Constraint 4 MWD=PRWD enforces the morphological word to be a well-formed prosodic word, ensuring that clitics are incorporated into a surrounding word. Constraints 5-7 are **Labeling Constraints**, which this paper introduces. Labeling constraints require that all morphological words be labeled with a category reflecting a prosodically strong

morpheme within that morphological word. For example, a syntactic verbal head which corresponds to a vocabulary item /V/ within a morphological word is labeled with {V}, as shown below.

(35)
    a.   x°   <-> (/x/)$_{\{x\}}$
    b.   *v*°+V° <-> (/V/)$_{\{V\}}$
    c.   D°   <-> (/D/)$_{\{D\}}$

The labeling constraint *COMPLEXMWD$_{\{LABEL\}}$ prohibits having more than one morphological label on a single MWd, and {V}>{D} prefers to have a label {V} over {D} when they are in competition. These will become important when we look at SVCs with objects.

    Within C-Stratum 1, constraints 8-9 ALIGN-/agr$_{sbj}$/-L and ALIGN-/asp/-R are Align constraints and enforce alignment between the edge of a clitic and the edge of a morphological word. Constraint 10 LINEARITYMAP-IO:LEX is a mapping constraint, which evaluates the interface mapping between syntactic hierarchical structure (the input) and morphological structure (the output). This constraint evaluates whether the hierarchical order of lexical constituents in the input is reflected in the linear order of counterparts in the output, and can be parameterized for specific grammars or sub-grammars. For example, in Degema the transitive verb structure [*v*°+V° [DP] …] is always mapped to a linear order / V D / (head-initial order). This constraint can be more technically defined based on specific properties of syntactic heads and VIs. This is outside of the scope of this paper, and for our purposes we will assume that this constraint gives us a baseline expectation for syntax-to-morphology mapping.

    Within C-Stratum 2, Faith and Mark 2 constraints counterweight the Mark 1 constraints in C-Stratum 1. Faith constraint 11 DEP-IO(NODE) penalizes the insertion of dissociated nodes such as subject and aspect agreement. Markedness constraints 12-13 assign a violation for every occurrence of subject or aspect agreement.

    Finally, C-Stratum 3 contains two Map constraints. Constraint 14 MAP(WD_TYPE) states that a syntactic head x° which is not dominated by a head x° is mapped to a morphological word (MWd) (see Embick & Noyer 2001:574).[12] By default syntactic words should correspond to morphological words, e.g. both functional and lexical heads correspondence to MWds.[13] Finally, constraint 15 LINEARITYMAP-IO:FNC limits manipulating the expected linear order of functional head exponents, e.g. the linear position of aspect with repect to lexical items.

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[12] Embick & Noyer's (2001: 574) definition: 'at the input to Morphology, a node X° is (by definition) a *morphosyntactic word* (MWd) iff X° is the highest segment of an X° not contained in another X°'.

[13] I specifically do not adopt Selkirk's (2011) MATCH[word, ω] constraint because this is formalized as matching syntactic constituents with phonological constituents directly, whereas I adopt that this is mediated by an initial morphological mapping.

Set	#	Constraint	Definition	Function
Mark 1	1	V=WF_MWD(AGR_SBJ)	For a MWd marked with label {Verb} ({V}), assign a violation if it is not marked with subject agreement	Verbal words have a proclitic
	2	V=WF_MWD(ASP)	For a MWd marked with label {Verb} ({V}), assign a violation if it is not marked with aspect	Verbal words have a enclitic
	3	V1>V2	Under competition, the first MWd marked with label {Verb} ({V}) (defined linearly) bears inflection over the second MWd marked {V}	Mark the first verb with inflection over the second when you can't mark both
	4	MWD=PRWD	A morphological word is a well-formed prosodic word	Clitics and light object pronouns incorporate into a surrounding word
	5	MWD_{LABEL}	For a MWd, assign a violation if a prosodically strong morpheme of category M does not project a morphological label {M}	Words containing a verb are labeled {V}, prosodically strong pronouns/nouns as {D}, etc.
	6	*COMPLEXMWD_{LABEL}	For a MWd, assign a violation if it is marked with more than one morphological label	Words with more than one lexical item are not labeled with both, i.e. *{V},{D}
	7	{V}>{D}	Under competition, a MWd should be marked with label {Verb} ({V}) over a label {D}	Mark words with a verb with a {V} label over a {D} label when you can't have both
Align	8	ALIGN-/AGR_SBJ/-L	The left edge of an /agr_sbj/ morpheme coincides with the left edge of a MWd	Agreement proclitics appear first in the word
	9	ALIGN-/ASP/-R	The right edge of an /asp/ morpheme coincides with the right edge of a MWd	Aspect enclitics appear last in the word
Map 1	10	LINEARITYMAP-IO:LEX	The hierarchical order of lexical constituents x° and y° in the input is reflected in the linear order of counterparts /x/ and /y/ in the output	Limits manipulating the expected linear order of lexical exponents (e.g. Vs, Prons, Ns)
Faith	11	DEP-IO(NODE)[14]	Morphemes in the output correspond to syntactic terminal heads in the input	Penalizes the insertion of dissociated nodes (e.g. Agr)
Mark 2	12	*AGR_ASP	Assign a violation for every instance of aspect agreement	Don't have aspect agreement
	13	*AGR_SBJ	Assign a violation for every instance of subject agreement	Don't have subject agreement
Map 2	14	MAP(WD_TYPE)	Map a syntactic head x° which is not dominated by a head x° to a morphological word (MWd)	By default, syntactic words should correspond to morphological words
	15	LINEARITYMAP-IO:FNC	The hierarchical order of a functional head x° with respect to any head y° in the input is reflected in the linear order of counterparts /x/ and /y/ in the output	Limits manipulating the expected linear order of functional head exponents (e.g. aspect)

Table 10: Constraint set accounting for Degema clitics patterns (solid lines indicate distinct crucially ordered Constraint-Strata)

[14] See also Wolf (2015:372) DEP-M(F) which penalizes the insertion of features not present in input.

5.2. **The candidate set**

This above constraint ranking will be used to evaluate a candidate set. Each syntactic input is mapped to a morphological output. The input-output mappings for the distribution of verbal clitics in Degema is provided in Table 11. These recapitulate the distribution of clitics: the single-marking pattern is found when there is no prosodically heavy object, and double-marking is found when there is. In the table below and throughout, forward slashes / / indicate the input and backward slashes \ \ indicate the output.

Type	Syntactic input			Correct morphological output	
V	/ $[_{aspP}$ asp° $[_{v1P}$ v_1°+V$_1$° [Ø $\cancel{V_1}$°]]]	/	→	\ (/agr$_{sbj}$/+/V/+/asp/)$_{\{V\}}$	\
V V	/ $[_{aspP}$ asp° $[_{v1P}$ v_1°+V$_1$° [Ø $\cancel{V_1}$° $[_{v2P}$	/	→	\ (/agr$_{sbj}$/+/V1/+/V2/+/asp/)$_{\{V\}}$	\
	v_2°+V$_2$° [$\cancel{V_2}$°]]]]				
V D$_\sigma$	/ $[_{aspP}$ asp° $[_{v1P}$ v_1°+V$_1$° [DP $\cancel{V_1}$°]]]	/	→	\ (/agr$_{sbj}$/+/V/+/D$_\sigma$/+/asp/)$_{\{V\}}$	\
V D$_\sigma$ V	/ $[_{aspP}$ asp° $[_{v1P}$ v_1°+V$_1$° [DP $\cancel{V_1}$° $[_{v2P}$	/	→	\ (/agr$_{sbj}$/+/V1/+/D$_\sigma$/+/V2/+/asp/)$_{\{V\}}$	\
	v_2°+V$_2$° [$\cancel{V_2}$°]]]]				
V D$_{\sigma\sigma}$	/ $[_{aspP}$ asp° $[_{v1P}$ v_1°+V$_1$° [DP $\cancel{V_1}$°]]]	/	→	\ (/agr$_{sbj}$/+/V/+/asp/)$_{\{V\}}$ * (/D$_{\sigma\sigma}$/)$_{\{D\}}$	\
V D$_{\sigma\sigma}$ V	/ $[_{aspP}$ asp° $[_{v1P}$ v_1°+V$_1$° [DP $\cancel{V_1}$° $[_{v2P}$	/	→	\ (/agr$_{sbj}$1/+/V1/+/asp/)$_{\{V\}}$ * (/D$_{\sigma\sigma}$/)$_{\{D\}}$ * \
	v_2°+V$_2$° [$\cancel{V_2}$°]]]]			(/agr$_{sbj}$2/+/V2/+/agr$_{asp}$2/)$_{\{V\}}$	

Table 11: Input-output mappings in Degema

Any constraint ranking proposed needs to successfully and uniformly adhere to these input-output mappings.

In order to assess the success of an OT-DM model, I generated a list of output candidates to be evaluated. These output candidates compete and the most optimal candidate is selected. These candidates were systematically generated along a series of dimensions.

(36) Dimensions along which output candidates were generated
    a. **IncD**: Did the verb and the pronominal object form one MWd or two?
      i.e.   (/V/+/D/)   vs.   (/V/) * (/D/)
    b. **IncV**: In SVCs, did the verbs form one MWd or two?
      i.e.   (/V1/+/V2/)   vs.   (/V1/) * (/V2/)
    c. **IncAsp**: Did the aspect marker and the verb form one MWd or two?
      i.e.   (/asp/+/V/)   vs.   (/asp/) * (/V/)
    d. **LinAsp**: What is the linear position of the aspect marker?
      i.e.   (/asp/+/V/)   vs.   (/V/+/asp/)
    e. **SbjAgr**: Did the verb appear with subject agreement in the same MWd?
      i.e.   (/V/)   vs.   (/agr$_{sbj}$/+/V/)
    f. **AspAgr**: Did the verb appear with aspect marking in the same MWd?
      i.e.   (/V/)   vs.   (/V/+/asp/)~(/V/+/agr$_{asp}$/)
    g. **Label**: Does the label of the MWd reflect a prosodically strong morpheme within it?
      i.e.   (/V/+/D$_\sigma$/)$_{\{V\}}$ vs.   (/V/+/D$_\sigma$/)$_{\{D\}}$

Each dimension had a number of values, e.g. IncV was a simple Y/N whereas AspAgr is more complicated in that it was evaluated twice in SVCs, once for each verb (N/YV1/YV2/YBoth). Every value of every dimension was combined to produce a set of candidates. Simplex inputs such as the /V/ type ($[_{aspP}$ asp° $[_{v1P}$ v_1°+V$_1$° [Ø $\cancel{V_1}$°]]]) had fewer output candidates (n=14) because not all dimensions or values were relevant. Complex inputs such as /V D$_{\sigma\sigma}$V/ had many more output candidates (n=214).

The first three dimensions IncD, IncV, and IncAsp reflect the presence or absence of one type of change associated with the DM operation Local Dislocation: the conversion of an independent morphological word MWd to a subword (SWd), a shift in morphological 'typing' (see Embick 2007b). For example, separate verbs would be (V)$_{MWd}$ * (V)$_{MWd}$ whereas morphologically-incorporated verbs would be ((V)$_{SWd}$ + (V)$_{SWd}$)$_{MWd}$. The fourth dimension LinAsp reflects another aspect of Local Dislocation, namely whether the aspect marker appears in its expected position or appears 'dislocated' with respect to a surrounding element (what 'expected' refers to is discussed below). The dimensions SbjAgr and AspAgr are equivalent to the DM operation DNI.

The generation of competing output candidates makes this OT-DM analysis distinct from DM analyses not implemented in a constraint-based model. In this OT-DM analysis, DM operations LD and DNI are freely available in all derivations, and are not strictly licensed by a lexical item or a particular grammatical or phonological context.

Strictly speaking, all morphemes within a specific input-output mapping are potentially subject to dislocating or the insertion of morphological nodes. Only those candidates appearing with these changes which are optimizing are selected.

5.3. **The constraint ranking and evaluation**
The constraint ranking from Table 10 above is summarized below, dividing constraints into their C-Stratum/type.

(37)   **C-Stratum 1**   **>>**   **C-Stratum 2**   **>>**   **C-Stratum 3**
          Mark 1   **Align/Map 1**   **>>**   **Faith/Mark 2**   **>>**   **Map 2**

$$
\begin{bmatrix}
\text{V=WF\_MWd(agr}_{sbj}) \\
\text{V=WF\_MWd(asp)} \\
\text{V1>V2} \\
\text{MWd=PrWd} \\
\text{MWd}_{\{label\}} \\
\text{*ComplexMWd}_{\{label\}} \\
\text{\{V\}>\{D\}}
\end{bmatrix}
\begin{bmatrix}
\text{Align-/agr}_{sbj}\text{/-L} \\
\text{Align-/asp/-R} \\
\text{Linearity-IO:Lex-to-Lex}
\end{bmatrix}
\text{>>}
\begin{bmatrix}
\text{DEP-IO(Node)} \\
\text{*agr}_{asp} \\
\text{*agr}_{sbj}
\end{bmatrix}
\text{>>}
\begin{bmatrix}
\text{Map(Wd\_Type)} \\
\text{Linearity-IO:Fnc}
\end{bmatrix}
$$

This constraint ranking was determined using OTSoft v2.5 (Hayes et. al 2013) by providing the program with fully evaluated tableaux for the 6 contexts. I illustrate this constraint ranking in the tableaux below.

The first tableau involves the /V/ input which involves no other verbs and no objects, shown in Tableau 2. The winning output is candidate 1. Candidates 8-14 do not appear with subject agreement /agr$_{sbj}$/ in the MWd containing the verb and therefore incur a fatal violation of V=WF_MWD(AGR$_{SBJ}$) are eliminated. Similarly candidate 7 violates V=WF_MWD(ASP) and is eliminated. In candidate 6, the asp° head is mapped to a VI /asp/ which appears in an expected pre-verbal position. However, because aspect clitics are prosodically deficient, if they appear within their own MWd they violate MWD=PRWD; because candidate 6 violates this it is eliminated. Candidate 5 incorporates /asp/ within the MWd containing the verb and therefore avoids a violation of MWD=PRWD; however this candidate is marked with two morphological labels {V} and {Asp} and therefore violates *COMPLEXMWD$_{\{LABEL\}}$ and is eliminated. Finally, candidates 2-4 containing MWds which are solely marked with {V} but the /asp/ marker does not appear at the right edge of the MWd, thereby violating ALIGN-/ASP/-R.

The winning candidate is therefore candidate 1 \ (/agr$_{sbj}$/+/V/+/asp/)$_{\{V\}}$ \ which does not incur any of these violations of constraint stratum (CS) 1. This candidate does incur lower ranking violations in CS 2 and 3, though they are non-fatal as all other candidates have been eliminated. This candidate appears with /agr$_{sbj}$/, violating both DEP-IO(NODE) and *AGR$_{SBJ}$ penalizing the insertion of dissociated nodes not present in the input. Further, this candidate violates mapping constraints MAP(WD_TYPE) because by default the Asp° head should map to an independent MWd which it does not, and LINEARITYMAP-IO:FNC because by default the Asp° head should be linearized before the verb.

Input:	[$_{aspP}$ asp° [$_{vIP}$ v_1° +V$_1$° [Ø V̶$_1$°]]]	V=WF_MWD(AGR$_{SBJ}$)	V=WF_MWD(ASP)	V1>V2	MWD=PRWD	MWD$_{\{LABEL\}}$	*COMPLEXMWD$_{\{LABEL\}}$	{V}>{D}	ALIGN-/AGR$_{SBJ}$/-L	ALIGN-/ASP/-R	LINEARITYMAP-IO:LEX	DEP-IO(NODE)	*AGR$_{ASP}$	*AGR$_{SBJ}$	MAP(WD_TYPE)	LINEARITYMAP-IO:FNC
							Constraint stratum (CS) 1					**CS 2**			**CS 3**	
1 ☞	(/agr$_{sbj}$/+/V/+/asp/)$_{\{V\}}$											1		1	1	1
2	(/agr$_{sbj}$/+/asp/+/V/)$_{\{V\}}$									1 !		1		1	1	
3	(/agr$_{sbj}$/+/V/+/asp/+/agr$_{asp}$/)$_{\{V\}}$									1 !		2		1	1	1
4	(/agr$_{sbj}$/+/asp/+/V/+/agr$_{asp}$/)$_{\{V\}}$									1 !		2	1	1	1	
5	(/agr$_{sbj}$/+/V/+/asp/)$_{\{V\},\{Asp\}}$						1 !					1		1	1	1
6	(/asp/)$_{\{Asp\}}$ * (/agr$_{sbj}$/+/V/+/agr$_{asp}$/)$_{\{V\}}$				1 !							2	1	1		
7	(/asp/)$_{\{Asp\}}$ * (/agr$_{sbj}$/+/V/)$_{\{V\}}$		1 !		1							1		1		
8	(/V/+/asp/)$_{\{V\}}$	1 !													1	1
9	(/asp/+/V/)$_{\{V\}}$	1 !								1					1	
10	(/asp/+/V/+/agr$_{asp}$/)$_{\{V\}}$	1 !								1		1	1		1	
11	(/V/+/asp/+/agr$_{asp}$/)$_{\{V\}}$	1 !								1		1	1		1	1
12	(/V/+/asp/)$_{\{V\},\{Asp\}}$	1 !					1								1	1
13	(/asp/)$_{\{Asp\}}$ * (/V/+/agr$_{asp}$/)$_{\{V\}}$	1 !			1							1	1			
14	(/asp/)$_{\{Asp\}}$ * (/V/)$_{\{V\}}$	1 !	1		1											

Tableau 2: /V/ input type

Moreover, Tableau 3 and Tableau 4 illustrate how this constraint ranking accounts for the correct outputs with /V D$_\sigma$/ and /V D$_{\sigma\sigma}$/ input types. Tableau 3 involving the /V D$_\sigma$/ type is a condensed version of the tableau found in Appendix 1: Evaluation (full tableaux). Output candidates 16-31 do not appear with subject agreement, and candidates 14-15 do not appear marked by aspect, and are therefore eliminated. Constraints 8-13 are eliminated because they violate MWD=PRWD, either because the prosodically deficient aspect VI /asp/ is not incorporated into a surrounding MWd or because the prosodically deficient monosyllabic object pronoun is not incorporated. Candidate 7 (/agr$_{sbj}$/+/V/+/D$_\sigma$/+/asp/)$_{\{V\},\{D\},\{Asp\}}$ involves incorporation of both /asp/ and /D$_\sigma$/ but is eliminated because it contains more than one morphological label violating *COMPLEXMWD$_{\{LABEL\}}$. Finally candidates 2-6 are eliminated as they contain an aspect marker which is not right-aligned to the MWd. As with the /V/ type above, the winning candidate here violates lower ranked constraints in CS 2 and 3. It incurs two violations of MAP(WD_TYPE) because both /D$_\sigma$/ and /asp/ do not belong to separate MWds.

	Input: $[_{aspP}$ asp° $[_{v1P}$ $v_1°$ +$V_1°$ [DP V̶ °]]]	V=WF_MWD(AGR_SBJ)	V=WF_MWD(ASP)	V1>V2	MWD=PRWD	MWD_{LABEL}	*COMPLEXMWD_{LABEL}	{V}>{D}	ALIGN-/AGR_SBJ/-L	ALIGN-/ASP/-R	LINEARITYMAP-IO:LEX	DEP-IO(NODE)	*AGR_ASP	*AGR_SBJ	MAP(WD_TYPE)	LINEARITYMAP-IO:FNC
												CS 2			**CS 3**	
1 ☞	(/agr_sbj/+/V/+/D_σ/+/asp/)_{V}											1		1	2	2
2	(/agr_sbj/+/asp/+/V/+/D_σ/)_{V}									1 !		1		1	2	
3	(/agr_sbj/+/V/+/asp/+/D_σ/)_{V}									1 !		1		1	2	1
4	(/agr_sbj/+/asp/+/V/+/D_σ/+/agr_asp/)_{V}									1 !		2	1	1	2	
5	(/agr_sbj/+/V/+/asp/+/D_σ/+/agr_asp/)_{V}									1 !		2	1	1	2	1
6	(/agr_sbj/+/V/+/D_σ/+/asp/+/agr_asp/)_{V}									1 !		2	1	1	2	2
7	(/agr_sbj/+/V/+/D_σ/+/asp/)_{V},{D},{Asp}						1 !					1		1	2	2
8	(/agr_sbj/+/V/+/asp/)_{V} * (/D_σ/)_{D}				1 !							1		1	1	1
9	(/asp/)_{Asp} * (/agr_sbj/+/V/+/D_σ/+/agr_asp/)_{V}				1 !							2	1	1	1	
…	[Cand 10-12]				1 !											
13	(/asp/)_{Asp} * (/agr_sbj/+/V/+/agr_asp/)_{V} * (/D_σ/)_{D}				2 !							2	1	1		
14	(/asp/)_{Asp} * (/agr_sbj/+/V/+/D_σ/)_{V}		1 !		1							1		1	1	
15	(/asp/)_{Asp} * (/agr_sbj/+/V/)_{V} * (/D_σ/)_{D}		1 !		2							1		1		
16	(/V/+/D_σ/+/asp/)_{V}	1 !													2	2
…	[Cand 17-30]	1 !														
31	(/asp/)_{Asp} * (/V/)_{V} * (/D_σ/)_{D}	1 !	1		2											

Tableau 3: /V D_σ/ input type

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Further the condensed Tableau 4 illustrates the /V $D_{\sigma\sigma}$/ type with a heavy object. Output candidates 16-33 violate a V=WF_MWd constraint, and 14-15 violate MWD=PRWD. Candidates 5-13 all involve cases where both the /asp/ marker and the heavy object /$D_{\sigma\sigma}$/ are incorporated into the MWd containing the verb. Because both /V/ and /$D_{\sigma\sigma}$/ are prosodically heavy, they each should project a morphological label, {V} and {D} respectively. Candidates 6-11 are only labeled with {V} while candidates 12-13 are only marked with {D}. Candidate 5 is marked with both {V} and {D}, but this violates the labeling markedness constraint *COMPLEXMWD$_{\{LABEL\}}$. Here, incorporation of the prosodically heavy /$D_{\sigma\sigma}$/ is too costly with respect to labeling constraints, and therefore appears in its own MWd. This constraint ranking therefore militates against 'unnecessary' local dislocation. Finally, as with the tableaux above, candidates 2-4 are eliminated as they contain an aspect marker which is not right-aligned to the MWd.

	Input: $[_{aspP}$ asp° $[_{v1P}$ $v_1°+V_1°$ $[$ DP $\cancel{V}{+}°$ $]$ $]$ $]$	Constraint stratum (CS) 1										CS 2			CS 3	
		V=WF_MWD(AGR$_{SBJ}$)	V=WF_MWD(ASP)	V1>V2	MWD=PRWD	MWD$_{\{LABEL\}}$	*COMPLEXMWD$_{\{LABEL\}}$	{V}>{D}	ALIGN-/AGR$_{SBJ}$/-L	ALIGN-/ASP/-R	LINEARITYMAP-IO:LEX	DEP-IO(NODE)	*AGR$_{ASP}$	*AGR$_{SBJ}$	MAP(WD_TYPE)	LINEARITYMAP-IO:FNC
1 ☞	$(/agr_{sbj}/+/V/+/asp/)_{\{V\}}$ * $(/D_{\sigma\sigma}/)_{\{D\}}$											1		1	1	1
2	$(/agr_{sbj}/+/asp/+/V/)_{\{V\}}$ * $(/D_{\sigma\sigma}/)_{\{D\}}$									1 !		1		1	1	
3	$(/agr_{sbj}/+/V/+/asp/+/agr_{asp}/)_{\{V\}}$ * $(/D_{\sigma\sigma}/)_{\{D\}}$									1 !		2		1	1	1
4	$(/agr_{sbj}/+/asp/+/V/+/agr_{asp}/)_{\{V\}}$ * $(/D_{\sigma\sigma}/)_{\{D\}}$									1 !		2	1	1	1	
5	$(/agr_{sbj}/+/V/+/D_{\sigma\sigma}/+/asp/)_{\{V\},\{D\},\{Asp\}}$						1 !					1		1	2	2
6	$(/agr_{sbj}/+/V/+/D_{\sigma\sigma}/+/asp/)_{\{V\}}$					1 !						1		1	2	2
7	$(/agr_{sbj}/+/asp/+/V/+/D_{\sigma\sigma}/)_{\{V\}}$					1 !				1		1		1	2	
8	$(/agr_{sbj}/+/V/+/asp/+/D_{\sigma\sigma}/)_{\{V\}}$					1 !				1		1		1	2	1
9	$(/agr_{sbj}/+/asp/+/V/+/D_{\sigma\sigma}/+/agr_{asp}/)_{\{V\}}$					1 !				1		2	1	1	2	
10	$(/agr_{sbj}/+/V/+/asp/+/D_{\sigma\sigma}/+/agr_{asp}/)_{\{V\}}$					1 !				1		2	1	1	2	1
11	$(/agr_{sbj}/+/V/+/D_{\sigma\sigma}/+/asp/+/agr_{asp}/)_{\{V\}}$					1 !				1		2	1	1	2	2
12	$(/V/+/D_{\sigma\sigma}/+/asp/)_{\{D\}}$					1 !		1							2	2
13	$(/agr_{sbj}/+/V/+/D_{\sigma\sigma}/+/asp/)_{\{D\}}$					1 !		1				1		1	2	2
14	$(/asp/)_{\{Asp\}}$ * $(/agr_{sbj}/+/V/+/agr_{asp}/)_{\{V\}}$ * $(/D_{\sigma\sigma}/)_{\{D\}}$				1 !							2	1	1		
15	$(/asp/)_{\{Asp\}}$ * $(/agr_{sbj}/+/V/+/D_{\sigma\sigma}/+/agr_{asp}/)_{\{V\}}$				1 !	1						2	1	1	1	
16	$(/asp/)_{\{Asp\}}$ * $(/agr_{sbj}/+/V/)_{\{V\}}$ * $(/D_{\sigma\sigma}/)_{\{D\}}$		1 !		1							1		1	1	
17	$(/asp/)_{\{Asp\}}$ * $(/agr_{sbj}/+/V/+/D_{\sigma\sigma}/)_{\{V\}}$		1 !		1	1						1		1	1	
18	$(/V/+/asp/)_{\{V\}}$ * $(/D_{\sigma\sigma}/)_{\{D\}}$	1 !													1	1
…	[Cand 19-31]	1 !														
32	$(/asp/)_{\{Asp\}}$ * $(/V/)_{\{V\}}$ * $(/D_{\sigma\sigma}/)_{\{D\}}$	1 !	1		1											
33	$(/asp/)_{\{Asp\}}$ * $(/V/+/D_{\sigma\sigma}/)_{\{V\}}$	1 !	1		1	1									1	

Tableau 4: /V D$_{\sigma\sigma}$/ input type

From these tableaux, the effects of DM operations LD and DNI emerge under specific constraint rankings, shown below. Crucially, the two components of LD – namely dislocating of a morphological constituent and change the type of a morphological constituent – are split into two sets of constraint interactions, entailing that they are separate individual components.

(38) **Emergence of DM operations LD and DNI**

    a.   **DNI:** Insertion of morphological nodes not present in input

$$\begin{bmatrix} V{=}WF\_MWd(asp) \\ V{=}WF\_MWd(agr_{sbj}) \end{bmatrix} \gg \begin{bmatrix} Dep\text{-}IO(Node) \\ *agr_{asp} \\ *agr_{sbj} \end{bmatrix}$$

    b.   **LD (dislocating):** Dislocating MWd/SbWd with respect to local MWd/SbWd

          $[\text{Align-/asp/-R}] \gg [\text{LinearityMap-IO:Fnc}]$

    c.   **LD (typing):** MWd to SbWd morphological type-shifting

$$\begin{bmatrix} MWd{=}PrWd \\ V{=}WF\_MWd(asp) \end{bmatrix} \gg [\text{Map(Wd\_Type)}]$$

I now turn to how this constraint ranking can derive the correct outputs in serial verb constructions. Each of these input-output mappings has considerably more output candidates, i.e. the /V V/ type (n=86), the /V D_σ V/ type (n=206), and the /V $D_{\sigma\sigma}$ V/ type (n=214). Again, these tableaux below are condensed versions of those in Appendix 1: Evaluation (full tableaux).

Tableau 5 involves the /V V/ input. Like in the tableaux above, candidates 30-39 and 40-86 are eliminated as they violate V=WF_MWD(AGR_{SBJ}) and V=WF_MWD(ASP) respectively. Further, candidates 23-29 violate MWD=PRWD by not incorporating /asp/, candidates 11-22 are eliminated because not all /agr_{sbj}/ markers align to the left edge, and 3-10 are eliminated because not all /asp/ markers align to the right. Unlike in the tableaux above, there are *two* remaining candidates 1-2 which do not violate any constraint in CS 1. In both candidates, MWds which contain verbs appear with appropriate inflection and obeys all alignment constraints. In candidate 2 (the loser), the verbs appear in separate MWds and each are marked with a full set of inflectional markers, incurring three violations of DEP-IO(NODE) (one for each agreement marker). In contrast, candidate 1 (the winner) involves the incorporation of /V2/ with /V1/ and /V2/ forming a single /MWd/, with only one violation of Dep-IO(Node). This winning form has additional violations of mapping constraints in CS 3, but they are non-fatal.

	Input: $[_{aspP}$ asp° $[_{v1P}$ v_1°+V$_1$° [Ø V̶$_1̶$° $[_{v2P}$ v_2°+V$_2$° [V̶$_2̶$°]]]]]	V=WF_MWD(AGR$_{SBJ}$)	V=WF_MWD(ASP)	V1>V2	MWD=PRWD	MWD$_{\{LABEL\}}$	*COMPLEXMWD$_{\{LABEL\}}$	{V}>{D}	ALIGN-/AGR$_{SBJ}$/-L	ALIGN-/ASP/-R	LINEARITYMAP-IO:LEX	DEP-IO(NODE)	*AGR$_{ASP}$	*AGR$_{SBJ}$	MAP(WD_TYPE)	LINEARITYMAP-IO:FNC
												CS 2			**CS 3**	
1 ☞	(/agr$_{sbj}$1/+/V1/+/V2/+/asp/)$_{\{V\}}$											1		1	2	2
2	(/agr$_{sbj}$1/+/V1/+/asp/)$_{\{V\}}$ * (/agr$_{sbj}$2/+/V2/+/agr$_{asp}$1/)$_{\{V\}}$											3 !	1	2	1	1
3	(/agr$_{sbj}$1/+/asp/+/V1/+/V2/)$_{\{V\}}$									1 !		1		1	2	
…	[Cand 4-9]									2 !						
10	(/agr$_{sbj}$1/+/V1/+/agr$_{asp}$1/+/V2/+/asp/+/agr$_{asp}$2/)$_{\{V\}}$									2 !		3	2	1	2	2
11	(/V1/+/agr$_{sbj}$1/+/V2/+/asp/)$_{\{V\}}$								1 !			1		1	2	2
…	[Cand 12-21]								1 !							
22	(/agr$_{sbj}$1/+/V1/+/agr$_{asp}$1/+/agr$_{sbj}$2/+/V2/+/asp/+/agr$_{asp}$2/)$_{\{V\}}$								1 !	2		4	2	2	2	2
23	(/asp/)$_{\{Asp\}}$ * (/agr$_{sbj}$1/+/V1/+/V2/+/agr$_{asp}$1/)$_{\{V\}}$				1 !							2	1	1	1	
…	[Cand 24-28]				1 !											
29	(/asp/)$_{\{Asp\}}$ * (/agr$_{sbj}$1/+/V1/+/agr$_{asp}$1/+/agr$_{sbj}$2/+/V2/+/agr$_{asp}$2/)$_{\{V\}}$				1 !				1	1		4	2	2	1	
30	(/agr$_{sbj}$1/+/V1/+/asp/)$_{\{V\}}$ * (/agr$_{sbj}$2/+/V2/)$_{\{V\}}$		1 !									2		2	1	1
…	[Cand 31-39]		1 !													
39	(/asp/)$_{\{Asp\}}$ * (/agr$_{sbj}$1/+/V1/)$_{\{V\}}$ * (/agr$_{sbj}$2/+/V2/)$_{\{V\}}$		2 !	1								2		2		
40	(/V1/+/V2/+/asp/)$_{\{V\}}$	1 !													2	2
41	(/agr$_{sbj}$1/+/V1/+/asp/)$_{\{V\}}$ * (/V2/+/agr$_{asp}$1/)$_{\{V\}}$	1 !										2	1	1	1	1
…	[Cand 42-85]	1 !														
86	(/asp/)$_{\{Asp\}}$ * (/V1/)$_{\{V\}}$ * (/V2/)$_{\{V\}}$	2 !	2	1												

Tableau 5: /V V/ input type (Condensed tableau)

Tableau 6 (p. 31) presents a condensed tableau with the /V D_σ V/ input type and Tableau 7 (p. 32) a condensed tableau with the /V $D_{\sigma\sigma}$ V/ type. In both tableaux, a large number of candidates are eliminated by incurring a fatal violation of highly ranked V=WF_MWd(agr_{sbj}), V=WF_MWd(asp), or MWd=PrWd. Of crucial importance to note, in Tableau 7 candidates 26-62 are eliminated as they have output structures involving /V/ and /$D_{\sigma\sigma}$/ within the a single MWd (an incorporated pronoun) but are marked by only one morphological label, parallel to the candidates eliminated in Tableau 4 with the /V $D_{\sigma\sigma}$/ input type. This ensures that a prosodically heavy pronoun forms its own MWd which it labels with {D} as in candidates 1-22.

In both tableaux, all other remaining candidates other than the top two are eliminated by violating an alignment constraint. The remaining two candidates in the /V D_σ V/ type in Tableau 6 are differentiated as they are in the /V V/ type: candidate 2 incurs more violations of Dep-IO(Node) than candidate 1. Compare this to the two remaining candidates in the /V $D_{\sigma\sigma}$ V/ type in Tableau 7. Here, although candidate 1 \ (/agr_{sbj}1/+/V1/+/asp/)$_{\{V\}}$ * (/$D_{\sigma\sigma}$/)$_{\{D\}}$ * /agr_{sbj}2/+/V2/+/agr_{asp}1/)$_{\{V\}}$ \ incurs more violations of Dep-IO(Node) than candidate 2 \ (/agr_{sbj}1/+/V1/+/V2/+/asp/)$_{\{V\}}$ * (/$D_{\sigma\sigma}$/)$_{\{D\}}$ \, this latter candidate loses because it incurs more fatal violations of LINEARITYMAP-IO:LEX. Recall that this constraint states that the 'hierarchical order of lexical constituents x° and y° in the input is reflected in the linear order of counterparts /x/ and /y/ in the output', and thereby limits manipulating the expected linear order of lexical exponents such as verbs and nouns/pronouns. In Tableau 7, candidate 2 violates this constraint twice as /V2/ is not linearized after the object /D/ as expected, but rather incorporates over this element into the MWd containing /V1/. There are several alternative constraints one could posit - e.g. one involving a flavor of locality – but the result would be the same: this candidate is eliminated in favor of the double-marking pattern.

Input:		[asp P asp° [v1P v1°+V1° [DP V̶1̶ [v2P v2°+V2° [V̶2̶°]]]]]	Constraint stratum (CS) 1 — V=WF_MWD(AGRSBJ)	V=WF_MWD(ASP)	V1>V2	MWD=PRWD	MWD{LABEL}	*COMPLEXMWD{LABEL}	{V}>{D}	ALIGN-/AGRSBJ/-L	ALIGN-/ASP/-R	LINEARITYMAP-IO:LEX	CS 2 — DEP-IO(NODE)	*AGRASP	*AGRSBJ	CS 3 — MAP(WD_TYPE)	LINEARITYMAP-IO:FNC
1	☞	(/agrsbj1/+/V1/+/Dσ/+/V2/+/asp/){V}											1		1	3	3
2		(/agrsbj1/+/V1/+/Dσ/+/asp/){V} * (/agrsbj2/+/V2/+/agrasp1/){V}											3 !	1	2	2	2
3		(/agrsbj1/+/asp/+/V1/+/Dσ/+/V2/){V}									1 !		1		1	3	
…		[Cand 4-15]									1~2 !						
16		(/V1/+/Dσ/+/agrsbj1/+/V2/+/asp/){V}								1 !			1		1	3	3
…		[Cand 17-33]								1 !							
34		(/agrsbj1/+/V1/+/Dσ/+/V2/+/asp/){V},{D},{Asp}							1 !				1		1	3	3
…		[Cand 35-36]							1 !								
37		(/asp/){Asp} * (/agrsbj1/+/V1/+/Dσ/+/V2/+/agrasp1/){V}				1 !							2	1	1	2	
…		[Cand 38-71]				1~2 !											
72		(/asp/){Asp} * (/agrsbj1/+/V1/+/agrasp1/+/agrsbj2/+/V2/+/agrasp2/){V} * (/Dσ/){D}				2 !				1	1	2	4	2	2	1	
73		(/agrsbj1/+/V1/+/Dσ/+/asp/){V} * (/agrsbj2/+/V2/){V}		1 !									2		2	2	2
…		[Cand 74-94]		1 !													
95		(/asp/){Asp} * (/agrsbj1/+/V1/){V} * (/Dσ/){D} * (/agrsbj2/+/V2/){V}		2 !	2								2		2		
96		(/V1/+/Dσ/+/V2/+/asp/){V}	1 !													3	3
…		[Cand 97-205]	1~2 !														
206		(/asp/){Asp} * (/V1/){V} * (/Dσ/){D} * (/V2/){V}	2 !	2	2												

Tableau 6: /V Dσ V/ input type (Condensed tableau)

Input header: [$_{aspP}$ asp° [$_{v1P}$ v_1° +V$_1$° [DP V$_\pm$° [$_{v2P}$ v_2° +V$_2$° [V$_2$°]]]]]

#		Input candidate	V=WF_MWD(AGR$_{SBJ}$)	V=WF_MWD(ASP)	V1>V2	MWD=PRWD	MWD$_{\{LABEL\}}$	*COMPLEXMWD$_{\{LABEL\}}$	{V}>{D}	ALIGN-/AGR$_{SBJ}$/-L	ALIGN-/ASP/-R	LINEARITYMAP-IO:LEX	DEP-IO(NODE)	*AGR$_{ASP}$	*AGR$_{SBJ}$	MAP(WD_TYPE)	LINEARITYMAP-IO:FNC
			CS 1										**CS 2**			**CS 3**	
1	☞	(/agr$_{sbj}$1/+/V1/+/asp/)$_{\{V\}}$ * (/D$_{\sigma\sigma}$/)$_{\{D\}}$ * (/agr$_{sbj}$2/+/V2/+/agr$_{asp}$1/)$_{\{V\}}$											3	1	2	1	1
2		(/agr$_{sbj}$1/+/V1/+/V2/+/asp/)$_{\{V\}}$ * (/D$_{\sigma\sigma}$/)$_{\{D\}}$									2 !		1		1	2	2
3		(/agr$_{sbj}$1/+/asp/+/V1/)$_{\{V\}}$ * (/D$_{\sigma\sigma}$/)$_{\{D\}}$ * (/agr$_{sbj}$2/+/V2/+/agr$_{asp}$1/)$_{\{V\}}$								1 !			3	1	2	1	
…		[Cand 4-9]								1~2 !							
10		(/agr$_{sbj}$1/+/V1/+/agr$_{asp}$1/+/V2/+/asp/+/agr$_{asp}$2/)$_{\{V\}}$ * (/D$_{\sigma\sigma}$/)$_{\{D\}}$									2 !	2	3	2	1	2	2
11		(/V1/+/agr$_{sbj}$1/+/V2/+/asp/)$_{\{V\}}$ * (/D$_{\sigma\sigma}$/)$_{\{D\}}$								1 !		2	1		1	2	2
…		[Cand 12-21]								1 !							
22		(/agr$_{sbj}$1/+/V1/+/agr$_{asp}$1/+/agr$_{sbj}$2/+/V2/+/asp/+/agr$_{asp}$2/)$_{\{V\}}$ * (/D$_{\sigma\sigma}$/)$_{\{D\}}$								1 !	2	2	4	2	2	2	2
23		(/agr$_{sbj}$1/+/V1/+/D$_{\sigma\sigma}$/+/V2/+/asp/)$_{\{V\},\{D\},\{Asp\}}$						1 !					1		1	3	3
…		[Cand 24-25]						1 !									
26		(/agr$_{sbj}$1/+/V1/+/D$_{\sigma\sigma}$/+/V2/+/asp/)$_{\{V\}}$					1 !						1		1	3	3
…		[Cand 27-61]					1~2 !										
62		(/agr$_{sbj}$1/+/V1/+/D$_{\sigma\sigma}$/+/agr$_{sbj}$2/+/V2/+/asp/)$_{\{D\}}$					2 !		1	1			2		2	3	3
63		(/asp/)$_{\{Asp\}}$ * (/agr$_{sbj}$1/+/V1/+/agr$_{asp}$1/)$_{\{V\}}$ * (/D$_{\sigma\sigma}$/)$_{\{D\}}$ * (/agr$_{sbj}$2/+/V2/+/agr$_{asp}$2/)$_{\{V\}}$				1 !							4	2	2		
…		[Cand 64-75]				1 !											
76		(/asp/)$_{\{Asp\}}$ * (/agr$_{sbj}$1/+/V1/+/D$_{\sigma\sigma}$/+/agr$_{asp}$1/+/agr$_{sbj}$2/+/V2/+/agr$_{asp}$2/)$_{\{V\}}$				1 !	1			1	1		4	2	2	2	
77		(/agr$_{sbj}$1/+/V1/+/asp/)$_{\{V\}}$ * (/D$_{\sigma\sigma}$/)$_{\{D\}}$ * (/agr$_{sbj}$2/+/V2/)$_{\{V\}}$		1 !									2		2	1	1
…		[Cand 78-100]		1~2 !													
101		(/asp/)$_{\{Asp\}}$ * (/agr$_{sbj}$1/+/V1/+/D$_{\sigma\sigma}$/)$_{\{V\}}$ * (/agr$_{sbj}$2/+/V2/)$_{\{V\}}$		2 !		1	1						2		2	1	
102		(/agr$_{sbj}$1/+/V1/+/asp/)$_{\{V\}}$ * (/D$_{\sigma\sigma}$/)$_{\{D\}}$ * (/V2/+/agr$_{asp}$1/)$_{\{V\}}$	1 !										2	1	1	1	1
…		[Cand 103-213]	1~2 !														
214		(/asp/)$_{\{Asp\}}$ * (/V1/+/D$_{\sigma\sigma}$/)$_{\{V\}}$ * (/V2/)$_{\{V\}}$	2 !	2		1	1									1	

Tableau 7: /V D$_{\sigma\sigma}$ V/ input type (Condenced tableau)

5.4. **Morphological labeling**

One innovation of this analysis is morphological labeling, e.g. MWds with verbs are marked with label {V}. Morphological labeling allows for sufficiently local verbs associated with independent V° heads to incorporate and form a single MWd, i.e. a morphological compound ((/V1/)$_{SbWd}$+(/V2/)$_{SbWd}$)$_{MWd\{V\}}$. Verbs which are not sufficiently local do not form a compound, e.g. the /V D$_{\sigma\sigma}$ V/ type does not become *((/V1/)$_{SbWd}$+(/D$_{\sigma\sigma}$/)$_{SbWd}$+(/V2/)$_{SbWd}$)$_{MWd\{V\}}$ because of conflict with the incorporated /D/ labeling this MWd with a label {D}. In other words, morphological labeling facilitates the formation of a constituent involving only words of the same lexical category (e.g. V), and disallowing such a constituent if the words are of different categories (e.g. V and D). In terms of this analysis, morphological labeling counteracts potential 'mass local dislocation' for well-formedness conditions, wholesale incorporating of all morphemes into a single MWd to satisfy a markedness condition.

There is support in the literature that morphological labeling. Lexical categories such as nouns and verbs often display distinct phonological profiles even in the same language, e.g. in terms of the array of phonological contrasts, resistance to assimilation, among others (see references in Smith 2011). If these differences are analyzed as part of a speaker's synchronic grammar (rather than diachronic residue), then phonology requires access to lexical category information. For example, in Lenakel [tnl] (Oceanic: Vanuatu) primary stress falls on the penult (Lynch 1974, 1978). However, secondary stress in nouns falls on every other syllable from the primary-stress, whereas in verbs it is assigned from the initial syllable of the word (in both simplex and complex stems).

(39) Lenakel secondary stress
   a. Nouns: secondary stress assigned rightward from primary-stress
      i. / nɨmʷakɨlakɨl /   [nɨ.**mʷɒ̀**.gə.**lá**.gəl] 'beach' (Lynch 1978:19)
      ii. / kam-lomhanteni /   [kam.**lɔ̀**.ṃan.**dɛ́**.ni] 'for Lomhanteni' (Lynch 1974:83)
      iii. / kam-titoŋa /   [**kàm**.dʲi.**dɔ́**.ŋa]   'for Titoŋa' (Lynch 1974:183)
   b. Verbs: secondary stress assigned leftward from initial syllable
      i. / n-ɨm-ausito /   [**nì**.maw.**sí**.do]   'you (sg.) told a story' (Lynch 1974:66)
      ii. / n-ɨm-ai-ausito /   [**nì**.ma.yu.**sí**.do]   'you (pl.) told a story' (Lynch 1974:66)
      iii. / t-n-ak-am-ar-olkeikei / [**tì**.nɑ.**gà**.mɑ.řɔl.**géy**.gey] 'you (pl.) told a story' (Lynch 1978:19)

Additionally, in Finnish there are vowel changes to stems when they appear adjacent to plural –*i*. With nouns, there is a preference for stem-final /a/ to change to /o/ in this context, but with adjectives in the same context there is a preference to delete stem-final /a/.

(40) Finish stem vowel alternation when adjacent to PL –*i* (Anttila 2002:13)
   a. Nouns: /a/ to /o/ change preferred
      /kihar**a**-i-ssa/   'curl-PL-INESSIVE'   [kihar**o**-i-ssa]
   b. Adjectives: deletion of /a/ preferred
      /kihar**a**-i-ssa/   'curly-PL-INESSIVE'   [kihar**Ø**-i-ssa]

Smith (2011) also notes English as an example (albeit a complicated one), where that is a 'a preference (not a requirement) for initial/trochaic stress in disyllabic nouns versus final/iambic stress in disyllabic verbs.'

It should be noted that cases where noun vs. verb phonology is carried over into derived words is rare in the literature, discussed in Inkelas (2014:14-15,50-59). Inkelas notes that 'it is much harder to find a language in which one phonological generalization holds of all nouns, whether monomorphemic or derived, and different phonological generalization holds of all verbs, whether monomorphemic or derived' (p. 51), and that 'even Japanese, perhaps the most-cited example in the literature of a noun-verb asymmetry because of its accentuation patterns, does not generalize the asymmetry to complex nouns and verbs' (p. 52).

Morphological labeling predicts to find morphological and phonological operations (clitic alignment requirements, phonological distributions or alternations) sensitive to the particular morphological label {M}, e.g. a language where tone spreads onto a MWd with label {V} but not {N} (controlling for relevant factors). This theory therefore makes testable predictions which should be evaluated with a larger typology of category-specific effects.

6. **Against two alternatives**

6.1. **Alternative 1 – Syntactic verb movement**

One alternative to my analysis is what I refer to as the *syntactic verb movement alternative*. Recall from the discussion of the syntax of Degema SVCs in section 3.3 (p. 9) that I assume a vP complementation structure of SVCs where V$_1$ selects v_2P as its complement: [$_{ASPP}$ ASP° [$_{vP}$ v_1° [V$_1$° [$_{vP}$ v_2° [V$_2$°]]]]] (Collins 1997, 2002). I have called verbs in the single-marking clitic pattern a *morphological compound* based on their acting as a single constituent with respect to clitic marking (and grammatical tone – section 4.3). Under my analysis, both single-marking and double-marking SVCs share the same syntactic structure and are subject to the same sequence of syntactic operations. In other words, both patterns are syntax-equivalent up to the point of spell-out.

In contrast, the syntactic verb movement alternative derives the constituency of the two verbs by overt syntactic head-movement, whether by V2 moving to V1 directly, or both V1 and V2 moving to the same higher functional head such as $v1$. Under this alternative, single-marking is attributed to the verbs forming a syntactic compound and therefore are inflected like non-compound verbs with a single set of clitics. Double-marking is attributed to the lack of syntactic verb movement under specific conditions resulting in the two verbs being spelled-out as separate words.

Syntactic verb movement in SVCs is argued for in Collins' (2002) analysis of ǂHoan verb compounds [huc] (Kxa, 'Khoisan': Botswana), exemplified in (41). Here, the verbs cluster in a pre-object field and are marked by a single aspect marker *a-*. Both arguments of the verbs appear afterwards.

(41) Verb compound derived via syntactic movement in ǂHoan (Collins 2002:1)

ma	a-	**[**	**q‖hu**	**ǀ'o**	**]**	djo	ki	kx'u	na
1SG	PROG	**[**	**pour**	**put.in**	**]**	water	PART	pot	in
		[	V1	V2	]	O1		O2	

'I am pouring water into the pot.'

I refer the reader to the original paper for syntactic details of this analysis.

This alternative is attractive in that it nullifies the need for local dislocation sensitive to particular lexical categories, and unifies the application of dissociated node insertion of agreement heads without stipulation. This syntactic alternative therefore provides us the best chance of success in accounting for the Degema patterns in a strictly serial rule-based DM model without constraints, optimization, and output-sensitivity.

6.1.1 Argument 1: Phonologically null objects show single-marking pattern

The first argument against the syntactic alternative is that phonologically null objects of V1 show the single-marking pattern. I demonstrated above that there is no semantic difference between the single- and double-marking pattern: all SVC types may show either pattern depending on the surface order of nouns and verbs, e.g. examples (7)-(8), p. 8. Consider the data in (42) involving question words in SVCs. When the question word *ovo* 'who' appears in-situ in object position (ex. a), the verbs are not sufficiently local and therefore cannot form a single MWd; as a consequence, each is marked with a set of clitics, the double-marking pattern. When the question word appears ex-situ in a cleft construction, no object then intervenes between the verbs and they become sufficiently local and appear with single-marking (ex. b). It is ungrammatical in this ex situ context to mark the verbs with double-marking.

(42) Question word patterns in SVCs

    a. In situ – Double-marking pattern

        mi=ɖúw=n   **óvo**   mi̧=tá=an ?

        1SG.SET2=follow=FAC **who**   1SG.SET2=go=FAC

        'I went with **who**?' (E.E. Kari p.c., 2015 Aug 24)

    b. Ex situ – Single-marking pattern

        ovó$_i$ nú̧ mi=ɖúw   *t$_i$* tá̧=ān ? Cf. Ungram. *Ovó$_i$ nú̧   mi=ɖú~~ū~~w *t$_i$* **mi̧**=tá=ān ?

        who   that 1SG.SET2=follow   ~~who~~ go=FAC

        '**Who** did I go with?' (E.E. Kari p.c., XXX) [ohk_2017XXXX]

Example (43) shows that single-marking likewise surfaces when an object is not present after V1 due to focus clefting (a.), relativization (b.), or object *pro*-drop (c.). This last example is especially telling as it involves pro-drop from two transitive verbs, resulting in five sufficiently local verbs. All five verbs form a MWd, with one proclitic on V1 and one enclitic on V5, and a H tone melody over the entire verbal complex.

(43) Single-marking pattern whenever verbs are sufficiently local
    a. Focus via clefting

kú   **ọ́yi$_i$**   nụ́   mi=ḍúw   **t_i**   tá=ān
not   **her/him**   that   1SG.SET2=follow ~~her/him~~   go=FAC
'It was not **her/him** that I went with' (E.E. Kari p.c., 2015.10.24)

    b. Relativization

owéy$_i$ nụ́   mi=ḍúw   **t_i**   tá=tē   [Cf. Ungram. *owéy$_i$ nụ́ mi=ḍúw=**tē** t_i **mị**=tá=tē]
person   that   1SG.SET2=follow ~~person~~   go=PRF
"the person whom I have gone with" (E.E. Kari p.c. 2015.10.24)

    c. Object drop (indicated by Ø)

Ohoso ọ=tá   ḍẹ **Ø** vọ́ **Ø** yị́   kị́yé=n ọ́yi
Ohoso 3SG.SET2=go buy **Ø** take **Ø** come give=FAC her/him
'Ohoso went and bought (something) and brought (it) to her/him.' (Kari 2004: 121)

These data illustrate that clitic marking is insensitive to the selectional properties of the verbs, e.g. transitive vs. intransitive verb roots. If single-marking were the result of syntactic head movement, movement of the lower V2 head upwards would be triggered by a feature of a higher functional head. Under standard Minimalist assumptions, this predicts that by default when the syntactic structural condition is met, verb movement takes place. We therefore expect for single and double-marking patterns to be stable in the absence of an intervening object, as the presence of an object is orthogonal to the presence of a strong feature on a functional head. This is in particularly expected under a *Copy Theory of Movement* (Nunes 1995), where 'traces' are simply lower copies of moved constituents and are present in the syntax, but deleted at spell-out.

6.1.2 Argument 2: Unmotivated 'blocking' of head movement by an overt object
The second argument is that there is unmotivated 'blocking' of head movement by an overt object between V1 and V2, a counterpart to the first argument. Under the syntactic head movement alternative, V2 undergoes movement when triggered by a strong feature on a higher functional head. This movement therefore should be insensitive to whether there is an overt object present. Recall from the ǂHoan verb compound example in (41) above that both verbs are subject to movement past their arguments, resulting in a [V1+V2 O1 O2] order (whether in complement or specific position). In general, in languages exhibiting verb compounding which (superficially) resemble the ǂHoan type, the presence of an overt object does not block verb compounding (AUTHOR 201X: XX for languages/references).

    We can compare this to the Degema facts. In Degema, V2 does not move over an intervening object to form a constituent with V1. For example, in (44) the transitive verbs *tạm* 'chew' and *ḍọny* 'swallow' appear in a SVC and share the internal object *ịḍíyōm* 'food'. The object appears in its expected position between the verbs. It is ungrammatical to move V2 past the object, as in b.. Similarly, (45) shows that verb movement is equally disallowed with a transitive V1P and an intransitive V2. Here, V1 and V2 cannot appear adjacent.

(44) No verb movement with two transitive verbs sharing internal argument
    a. Grammatical cl=V O cl=**V**

Jzakume   ọ́=tam   ịḍíyom   ọ=**ḍóny**
Jzakume   NEG\3SG.SET1=chew food   3SG=**swallow**
'Jzakume did not chew food and swallow' (Kari 2003a: 278)

    b. Ungrammatical *cl=V+**V$_i$** O t_i

*Jzakume   ọ́=tam+**ḍọny$_i$**   ịḍíyom t_i
Jzakume   NEG\3SG.SET1=chew+**swallow** food   ~~swallow~~
Intended: 'Jzakume did not chew food and swallow' (E.E. Kari p.c., XXX)

(45) No verb movement with two transitive verb + intransitive verb (no argument sharing)
Breno o=ḍúw   mé tạ́=ān   Cf. Ungram. *Breno o=ḍúw+**tạ́$_i$**   mé=ēn   *t_i*
Breno 3SG.SET1=follow me go=FAC   3SG.SET1=follow+**go** me=FAC ~~go~~
'Breno went with me.' (Kari 2004:115; E.E. Kari p.c., XXX)

It is unclear how the presence of an object in this specifier position could act as a syntactic blocker for head-movement, and weakens support for the syntactic movement alternative.[15]

6.1.3 Argument 3: SVCs with prosodically light pronouns show single-marking

A third argument against V2 head movement involves prosodically light pronouns. Recall that although objects generally block the single-marking SVC pattern, intervening prosodically light pronouns require it, i.e. the cl=[V$_1$ D$_\sigma$ V$_2$]=cl pattern. Under the syntactic movement alternative, because V1 and V2 form a single syntactic word via head-movement, and because D$_\sigma$ still intervenes between them, it would be the case that D$_\sigma$ also undergoes syntactic movement to this same complex head, a type of syntactic pronoun incorporation.

This is problematic for a number of reasons. First, recall that only prosodically light pronouns show incorporation; prosodically heavy pronouns condition the double-marking pattern. If under the syntactic movement analysis pronouns are also subject to syntactic incorporation, it is not clear how the syntactic trigger could only target prosodically light pronouns rather than all pronouns with an appropriate feature [D]. Under DM assumptions, syntax would not have access to phonological information before spell-out. Moreover, recall that the light pronouns do not form any natural class either with respect to their morphosyntactic features. Light pronouns expone feature bundles 1SG, 2SG, 2PL, and 3PL, while heavy pronouns expone 3SG and 1PL (see Table 3).

Further, monosyllabic pronouns and bisyllabic pronouns do not exhibit different syntactic behavior which would warrant different featural representations or syntactic positions. For example, prosodically light pronouns do not behave like syntactically incorporated pronouns, e.g. they are able to undergo clefting to express focus.

(46) Prosodically light pronouns can be clefted
  a. Wọ́o   ụ=món   **mé**=ēn
     you   2SG.SET2=see   **me**=FAC
     'You saw me.' (Kari 2004: 164)
  b. O=yí=n   **mȩ́$_i$**   nụ́   wọ   u=móōn   *t$_i$*
     3SG.SET2=be=FAC   **me**   that you 2SG.SET2=see\FAC ~~me~~
     'It was I who you saw' (Kari 2004: 164)

If the pronoun internally merges with a verb via head movement, and then subsequently moves out of that complex, this would be a type of 'excorporation' (Roberts 1991, 2011). There is very limited evidence for bona fide excorporation in the literature, with many arguing against the possibility of it (e.g. Julien 2002:67-87 and references therein; Matushansky 2006:95; a.o.).

6.2. Alternative 2 - Deletion-under-identity of intermediate clitics

Another alternative is what I term the *deletion-under-identity* (*DUI*) *alternative*. Under this alternative, the grammar uniformly generates a full set of proclitics and enclitics on all verbs in a SVC, but under specific conditions involving identity, there is obligatory deletion of intermediate clitics. This is assumed to be a type of **ellipsis**. This is schematized in (47) below.

(47) Alternative 2 - Deletion-under-identity of intermediate clitics

		Single-marking pattern	Double-marking pattern
a.	Uniform clitic marking	agr$_{sbj}$=V$_1$=**asp Ø agr$_{sbj}$**=V$_2$=agr$_{asp}$	agr$_{sbj}$=V$_1$=**asp DP agr$_{sbj}$**=V$_2$=agr$_{asp}$
b.	Deletion-under-identity	agr$_{sbj}$=V$_1$=**asp ~~Ø agr$_{sbj}$~~**=V$_2$=agr$_{asp}$	agr$_{sbj}$=V$_1$=**asp DP agr$_{sbj}$**=V$_2$=agr$_{asp}$
c.	Surface pattern	agr$_{sbj}$=V$_1$　　　　V$_2$=agr$_{asp}$	agr$_{sbj}$=V$_1$=**asp DP agr$_{sbj}$**=V$_2$=agr$_{asp}$

DUI would take place under two conditions: (1) the deleted clitics appear adjacent, and (2) the clitics be featurally identical. One advantage of this alternative is that Dissociated Node Insertion would take place uniformly on all verbs, and avoid any need to license Local Dislocation of verbs. This would therefore be compatible with a strictly serial rule-based analysis, and not warrant modifying core DM architecture. Such an alternative is flexible and could come in two flavors. The first would be that each verb's extended projection in the SVC contains a separate Asp° head; therefore the second aspect morpheme would not be agr$_{asp}$ (see discussion in section 3.3). The second would

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[15] A limited pattern of verb compounding does exist in Degema with the verb *kịye* 'to give'. In a SVC, an allomorph of this verb *kẹ* appears right-adjacent to the other verb in the SVC, even if that other verb appears with an overt object. These patterns have not been analyzed at this time, and are superficially ambiguous between verbs in series vs. grammaticalization of *kịye* into a benefactive functional head *kẹ*.

be that there is one Asp° head, followed by concord aspect agreement. Both of these structures would result in the same input to a DUI operation.

There is precedence for similar types of DUI. Phenomena which fall under this rubric include coordination/conjunction reduction (Merchant 2012), 'suspended affixation' (Kabak 2007), and certain cases of verbal 'unbalanced coordination' (Johannessen 1998). An example of coordinate reduction in German nouns is in (48) below, where the medial morpheme *schaft* adjacent to the coordinator is deleted under identity.

(48) Coordinate reduction – German nouns
    [[Freund] ~~schaft~~] oder [[Feind] schaft]
    'Friendship or hostility' (Booij 1985: 144)

6.2.1 Argument 1: The DUI alternative overgenerates

I present two arguments against a DUI alternative. The first is that this analysis makes the wrong predications and overgenerates with respect to a fuller set of Degema data. For example, one context which meets the surface conditions (adjacency and featural identicality) is covert coordination and other conjoined clauses. Covert coordination involves two clauses adjacent without a phonologically overt coordinator as in (49)a. The second clause can involve a linker auxiliary, e.g. *kị́rị́* 'also.AUX' in (49)b. However, in these contexts DUI is not found and is in fact ungrammatical.

(49) Lack of DUI in conjoined clauses - Double-marking pattern obligatory
    a. [V₁] & [V₂]
        Ivioso o=kótú   mé=**ēn**   **ọ**=kpérí=n   īnúm
        Ivioso 3SG.SET2=call me=**FAC** **3SG.SET2**=tell=FAC something
        'Ivioso called me and told (me) something' (Kari 2003a:274)
    b. [V₁] & [aux V₂]
        Tatane o=kpé**ēny**   **ọ**=kírí   wáāy
        Tatane 3SG.SET2=wash**FAC** **3SG.SET2**=also.AUX spread\FAC
        'Tatane washed and also spread (something)'
        cf. *…o=kpény **Ø** kírí wáāy (E.E. Kari p.c., 2015 Oct 24) [ohk_2017XXXX]
    c. [V₁] but [V₂]
        ọ́=kú   dị́ bá**aw** **dọ** ọ=rékéréké   dị́=īn
        3SG.SET2=did.AUX   eat them**FAC** **but** 3SG.SET2 be.slow eat=FAC
        'She did eat them but she ate them rather slowly'
        cf. *ọ́=kú dị́ báaw dọ **Ø** rékéréké dị́=īn
        cf. *ọ́=kú dị́ báw **Ø** dọ ọ=rékéréké dị́=īn
        cf. *ọ́=kú dị́ báw **Ø** dọ **Ø** rékéréké dị́=īn   (E.E. Kari p.c., 2015 Dec 09)

The following example comes from a Degema text (Kari 1997). In this context, two events are being described, one *moving* and one *settling*, each expressed in Degema through two SVCs in two clauses. Within each SVC, the verbs appear adjacent and therefore show single-marking. However, across the SVCs, because they appear in distinct clauses they cannot conflate into a one larger single-marking structure. Pronunciation of this sentence reveals that there is a clause obligatory pause between the final verb of SVC1 *dẹsi* 'go far' and the first verb of SVC2 *tạ* 'go' (E.E. Kari, p.c., 2016 May 12).

(50)
    a. *…Bạnú Ipokuma, Obonogina ọ=vón=n éwéey nọ́onw ọ=wála pél Édá Sombreiro **ọ=dá réré fún dẹ́sí=īn**
        ọ=tá jzá=n m'úlúgbó-éjzi útóm ísen gbódia, oñañíná kúna, nụ ịnám sạ́a*
    '…At Ipokuma, Obonogina left with his people and waded across the Sombreiro River, **moved and settled in the furthest part** of the wilderness for the purposes of fishing, farming, and hunting' (Kari 1997:64)
    b. Single-marking *within* but not *between* SVCs
        …ọ=dá   réré fún   dẹsí=**īn**   ọ=tá   jzá=n…
        [3SG.SET2=then.AUX   walk ascend go.far=**FAC**]ₛᵥ𝒸₁ [**3SG.SET2**=go   stay=FAC]ₛᵥ𝒸₂
        '…[moved]ₛᵥ𝒸₁ and [settled]ₛᵥ𝒸₂…'

Under the DUI alternative, it is paradoxical why ellipsis does not take place across clauses as well as within them (cf. English *Sheᵢ talked to me then Øᵢ left*).

Further, under the DUI analysis the Degema single-marking pattern involves simultaneous backward deletion (deletion of material in the first conjunct) and forward deletion (deletion of material in the second conjunct) (Wilder 1995, 1997). Wilder (1995, 1997) illustrates that backward deletion and forward deletion are distinct operations subject to different phonological, syntactic, and semantic conditions, and we can therefore understand them as independent operations. However, in Degema when clitic deletion takes place, backward and forward deletion must take place simultaneously, and do not occur without each other. For example, in example (51) below, the proclitics share featural identity and the second proclitic appears at a conjunct boundary, identified as a common condition for DUI. However, deletion of the second proclitic is ungrammatical here and shows no variation for all speakers. The DUI alternative therefore overgenerates here.

(51) Ungrammatical forward deletion in the absence of backward deletion
    a.   Mi=ḍúw=n   ọ̀yi   ***(mị)**=tá=ān
        1SG.SET2=follow=FAC   her/him   ***(1SG.SET2)**=go=FAC
        'I went with her/him' (E.E. Kari p.c., 2015 Nov 02)
    b.   Tatane   o=kótú=n   ọ̀yi   ***(ọ)**=kpérí=n   īnúm
        Tatane   3SG.SET2=call=FAC   him   ***(3SG.SET2)**=tell=FAC   something
        'Tatane called him and told (him) something' (E.E. Kari p.c., 2015 Nov 02)

6.2.2 Argument 2: Requires DUI to be obligatory

One prevailing aspect of Deletion-Under-Identity and other types of ellipsis is that they are generally optional, noted overtly in Van Oirsouw (1985: 365). For example, the English sentence *he bought Ø and Ø cooked the chicken* can also surface as *he bought the chicken and he cooked the chicken*, if somewhat stilted-sounding. This is in stark contrast with the Degema clitic patterns where the single-marking and double-marking patterns are in complementary distribution. Ellipsis has been argued to be a 'repair' strategy in which case it is obligatory, e.g. Merchant (2001) on sluicing and repairing island violations and Kennedy & Merchant (2000) on N'-Ellipsis repairing Left Branch Condition violations. However, I do not see these cases of obligatory 'repair' ellipsis as relatable to the Degema facts presented here.

7. Discussion of post-syntactic architecture

As stated above summarizing the major tenets of DM (p.2), the major alteration which the OT-DM model makes is to the architecture of the syntax-phonology interface, viewing this transference as essentially parallelist and constraint-based, rather than serialist and rule-based. This is sketched below in Figure 2, adapted from Harley's (2014:228) DM schema and Broekhuis & Vogel's (2013:10) interface schema.
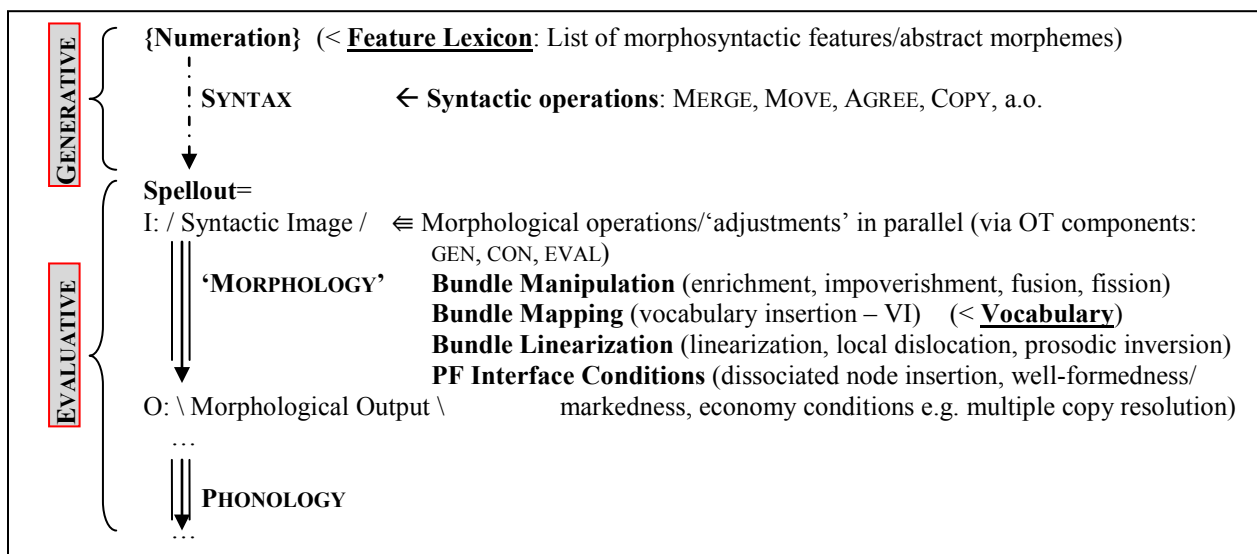
Figure 2: Revision of DM model according to OT-DM (PF branch only)

In this model, the numeration represents selecting a set of morphosyntactic features from the Feature Lexicon which are then subject to syntactic operations (e.g. MERGE, MOVE, AGREE, etc). At a certain point, this syntactic product is sent to spellout, which we can assume is triggered by a phase head (though this is orthogonal to the present

discussion). Under standard assumptions, spellout splits into two branches: a Phonetic/Phonological Form (PF) and a Logical Form (LF). The present alterations of the DM model affect the PF branch only.

At spellout, we can view the syntactic structure which is spelled out as a **Syntactic Image**. This image retains all syntactic constituency and dependencies such as c-command, but can no longer be manipulated by syntactic operations. This image acts as the Input to the morphology module in the Optimality Theoretic sense of the word. Morphology here can be understood as a series of morphological operations and adjustments which can affect the input image. These include: (1) **Bundle Manipulation** which alter the morphosyntactic featural content of input bundles (enrichment, impoverishment, fusion, fission), (2) **Bundle Mapping** (i.e. Vocabulary Insertion) which inserts Vocabulary Items from the Vocabulary into terminal nodes and where phonological content is supplied, (3) **Bundle Linearization**, which essentially translates the mobile-like hierarchical structure to a flat linear structure (linearization, local dislocation, prosodic inversion, etc.), and (4) **PF Interface Conditions** which enforce morphology specific requirements (e.g. dissociated node insertion, multiple copy resolution, a.o.).

As shown above with Degema, a candidate set generated from GEN is evaluated and the optimal candidate is selected. This in turn is fed into the Phonology module. OT-DM therefore unifies all of post-spellout on the PF branch as **Evaluative/Interpretive** via the same mechanisms: a ranked/weighted constraint set from CON, a list of output candidates from GEN, and an operation evaluating these candidates via EVAL. We can understand this as the **Evaluative** component of a derivation. This is in contrast with the **Generative** component of the derivation pre-spellout which does not involve these mechanisms.[16]

The strong claim of this proposal is that all operations take place in parallel and are not crucially ordered, which I call the **Morphology in Parallel Hypothesis (MPH).**

(52) **Morphology in Parallel Hypothesis (MPH)**:
    All morphological operations occur in parallel in a constraint-based model

MPH has a number of advantages. Given that Rules & Constraints DM à la Arregi & Nevins (2012) employs both rules and constraints, this results in a duplication problem which this hypothesis avoids. One of the original motivations of OT was eliminating duplication, as a constraint-based OT model accomplishes repairs and blocking and all other functions of a generative grammar (Prince & Smolensky 2004:239). Using the same architecture in both phonology and morphology is actually in the spirit of several practitioners of DM, such as Arregi & Nevins' (2012) design factor *Crossmodular Structural Parallelism* (see also discussion in Bobaljik 2017: section 3.4).[17]

As a final point of discussion, **morphological opacity** presents a significant challenge for the MPH, as opacity does for all parallelist models (Kiparsky 2000). **Counterfeeding opacity** refers to the underapplication of an operation when it would otherwise be expected, while **counterbleeding opacity** refers to the overapplication of an

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[16] A stronger form of this model would be that the only thing which is truly Generative is the Numeration, and the evaluative component begins before spell-out. Such a view is explicitly argued for in the OT Syntax literature (e.g. Grimshaw 1997, a.o.; Legendre et al. 2001; Broekhuis & Vogel 2013; Legendre et al. 2016; a.o.). Under this conception, syntactic operations are also decomposed into OT constraints and input-output mappings are evaluated by EVAL. For example, principles such as the EPP are decomposed into a markedness constraint SUBJECT (Lengendre et al 2016:X).

[17] I have argued that a leading catalyst for shifting to a parallelist DM is the presence of morphological conspiracies, such as the one demonstrated by the Degema data. Underlying this motivation is an assumption that such conspiracies *should* be captured by a model of grammar. This is explicitly argued against by Embick (2010). He states that the incorporation of conspiracies into grammatical theory is due to a fear of the **Putative Loss of Generalization (PLG)**, which he views should rather be attributed to grammar-external factors**:**

"An OT analysis can then say that the (phonological) grammar forces the attested distribution of allomorphs and, moreover, that the grammar explains the distribution by having morphological selection driven by optimization of the phonology of the output. The charge that is leveled against localist theories is that, while they might account for the distribution of allomorphs, they do not provide (within the grammar) a reason for the distribution. This type of argument against localist theories is based on their putative loss of generalization" Embick (2010:21)

"To the extent that there are generalizations to be made about surface forms, the localist theory can make them, but they must be derivative of another part of language in the broad sense. That is, the explanations cannot be part of the grammar in the narrow sense; instead, they are the result of diachrony, acquisition, and so on." Embick (2010:21)

See also Embick (2010:120) and discussion in Haugen (2011:10-13).

operation, e.g. when there is deletion of a conditioning environment. OT-DM can account for surface underapplication (counterfeeding type) by arguing that there is an additional higher markedness constraint which prevents the operation in a certain environment. Because R&C DM only involve constraints which are essentially filters, it cannot handle these cases because it would be assumed that such a filter would rule out the underapplication structure, contrary to fact. In contrast, R&C DM can account for the surface overapplication (counterbleeding type) as this is an expected result from rule-ordering and does not involve any filters. In contrast, OT-DM cannot account for this straightforwardly because the conditioning environment of the operation does not appear on the surface.

A purported case of morphological opacity from Arregi & Nevins (2012) involving Absolutive Promotion in Basque has been reanalyzed by Kiparsky (2017). He argues that all crucial ordering relations within the morphology are instances of feeding and bleeding, to which Arregi & Nevins (2017) respond with other claims of opacity in Basque morphotactics. I leave these issues aside, as the existence and status of morphological opacity is outside the scope of this paper, but note that it is fertile ground for testing the predictions of distinct DM models.[18]

8. Conclusion

This paper provided support for a modified DM model which I call Optimality Theoretic Distributed Morphology (OT-DM). The strongest form of this model was that all morphological operations take place in parallel, which I called the Morphology-in-Parallel Hypothesis (MPH). Although combining OT and DM is unorthodox in practice, I showed that a growing body warrant this modification, and provided evidence for OT-DM from a morphological conspiracy involving verbal clitics in Degema (Nigeria). To account for this conspiracy, I adopted that agreement clitics are inserted post-syntactically via the DM operation Dissociated Node Insertion (DNI), and further that verb complexes are formed post-syntactically via the operation Local Dislocation (LD). I argued that both these operations are triggered by a well-formedness markedness constraint which requires verbs to appear in properly inflected words on the surface. These DM operations were decomposed into a series of constraints which were crucially ranked. Candidates were freely generated from GEN and subject to all DM operations, and were evaluated via EVAL against the ranked constraint set. Finally, I illustrated that under standard views of DM in which DNI proceeds VI, a serial model results in an ordering paradox, and that even after parameterizing DM operation ordering in response, this model does not adequately account for the morphological conspiracy.

9. Glosses & abbreviations

Gloss	Meaning	Abbreviation	Meaning
1	first person	cl	clitic
2	second person	D_σ	pronoun of as specific syllable count
3	third person	DNI	Dissociated Node Insertion
AUX	auxiliary	DP	Determiner Phrase
FAC	factative tense/aspect	LD	Local Dislocation
NEG	negative	MPH	Morphology-in-Parallel Hypothesis
NPM	non-past marker	OT-DM	Optimality Theoretic Distributed Morphology
PL	plural	R&C DM	Rules & Constraints Distributed Morphology
PRF	perfect aspect	SVC	serial verb construction
SET1	set 1 proclitic	V	verb
SET2	set 2 proclitic	VI	Vocabulary Insertion
SG	singular		

10. Acknowledgments

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[18] In Degema, a potential case of counterfeeding opacity involving underapplication is the lack of agreement proclitics on verbs in positive singular imperatives, shown below. Compare positive plural imperatives and negative imperatives which *are* marked with a subject agreement proclitic (Kari 2004:34-38).

(iii) yí   ɗùw   mè tá
       come follow   me go
       'come and follow me' (E.E. Kari p.c., 2015.08.24)

It is notable that in this context where there is no subject clitic, grammatical tone patterns are less predictable compared to the patterns presented in Section 4.3 (see also AUTHOR X:X).

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12. Appendix 1: Evaluation (full tableaux)
[See separate files "FilesForappendix1_nllt" and "appendix 1 degema tableaux.xlsx"]

13. Appendix 2: Factorial typology of constraint set
[See separate files "FilesForappendix2_nllt_factyp" and "appendix 2 degema factorial typology.xlsx"]

Within Optimality Theory, a factorial typology refers to determining all the logical rankings of a set of constraints and computing the different winning sets of output candidates (Kager 1999:35). A factorial typology is particularly useful in determining if there are pathological predictions from a set of constraints. In the current data set, a potential example of a pathological prediction would be a grammar which inserted subject agreement when there is a

prosodically light object but not when there is a prosodically heavy one, a grammar which is not generated by the set of constraints proposed. By default, we expect the presence of subject agreement and the prosodic type of object to be orthogonal.

A factorial typology was determined using OTSoft v2.5 (Hayes et al. 2013). There were 15 constraints considered, making the logically possible number of grammars the factorial 15! (1307674368000). Restricting our inputs to the 6 input types presented above, the factorial typology resulted in 128 distinct grammars. The factorial typology does not reveal any pathological predictions, and therefore this constraint set is sufficiently restrictive. Major parameters of output variation include (1) not incorporating /D$_\sigma$/, (2) lacking subject agreement, (3) not incorporating /asp/ but having aspect agreement, (4) not dislocating /asp/ to the right edge, (5) dislocating /V2/ over a pronoun /D/, and (6) not incorporating /V2/ resulting in /V1/ and /V2/ forming separate MWds, with each verb receiving separate inflection i.e. the double-marking pattern.

A grammar of this last type is provided below with Grammar 18. Recall from section 3.2 that the /V V/ and /V D$_\sigma$ V/ types with double-marking is interpreted as questionable [(?)] to ungrammatical * in this dialect of Degema depending on speaker. A grammar which optimizes double-marking here can be derived if we reorder constraint stratum 3 over constraint stratum 2, as shown below (C-Strata order established in Tableaux above).

Input type		Grammar 18 - /V2/ appears in its own MWd
/V/	→	$(/\text{agr}_{sbj}/+/\text{V}/+/\text{asp}/)_{\{V\}}$
/V V/	→	$(/\text{agr}_{sbj}1/+/\text{V}1/+/\text{asp}/)_{\{V\}}$ * $(/\text{agr}_{sbj}2/+/\text{V}2/+/\text{agr}_{asp}1/)_{\{V\}}$
/V D$_\sigma$/	→	$(/\text{agr}_{sbj}/+/\text{V}/+/\text{D}_\sigma/+/\text{asp}/)_{\{V\}}$
/V D$_\sigma$ V/	→	$(/\text{agr}_{sbj}1/+/\text{V}1/+/\text{D}_\sigma/+/\text{asp}/)_{\{V\}}$ * $(/\text{agr}_{sbj}2/+/\text{V}2/+/\text{agr}_{asp}1/)_{\{V\}}$
/V D$_{\sigma\sigma}$/	→	$(/\text{agr}_{sbj}/+/\text{V}/+/\text{asp}/)_{\{V\}}$ * $(/\text{D}_{\sigma\sigma}/)_{\{D\}}$
/V D$_{\sigma\sigma}$ V/	→	$(/\text{agr}_{sbj}1/+/\text{V}1/+/\text{asp}/)_{\{V\}}$ * $(/\text{D}_{\sigma\sigma}/)_{\{D\}}$ * $(/\text{agr}_{sbj}2/+/\text{V}2/+/\text{agr}_{asp}1/)_{\{V\}}$

$$\begin{bmatrix} \underline{\textbf{CS 3}} \\ \text{Map(Wd\_Type)} \\ \text{Linearity-IO:Fnc} \end{bmatrix} \gg \begin{bmatrix} \underline{\textbf{CS 2}} \\ \text{DEP-IO(Node)} \\ *\text{agr}_{asp} \\ *\text{agr}_{sbj} \end{bmatrix}$$

Table 12: Constraint strata ranking and output candidate which corresponds to ?~*?~* grammaticality interpretation

A sample of grammars generated by the factorial typology is in Table 13.

Grammar	Label	Type	I: /V D$_\sigma$ V/	I: /V D$_{\sigma\sigma}$ V/	Ranking differences compared to attested (p. 23)
18	No V2 Inc	Don't incorporate /V2/	(sbj+V+D$_\sigma$+asp) (sbj+V+asp)	(sbj+V+asp) (D$_{\sigma\sigma}$) (sbj+V+asp)	[1 Map(Wd_Type) Linearity-IO:Fnc] >> [2 DEP-IO(Node) *agr$_{asp}$ *agr$_{sbj}$]
47	No Asp Inc	Don't incorporate /asp/ into /V/	(asp) (sbj+V+D$_\sigma$+V)	(asp) (sbj+V) (D$_{\sigma\sigma}$) (sbj+V)	[1 *agr$_{asp}$ LinearityMap-IO:Fnc] >> [2 V=WF_MWd(asp) MWd=PrWd] >> [3 Map(Wd_Type)]
15	V Over D	Incorporate /V2/ over /D/	(sbj+V+V+asp) (D$_\sigma$)	(sbj+V+V+asp) (D$_{\sigma\sigma}$)	[1 *agr$_{asp}$] >> [2 Map(Wd_Type) Lin-IO:Fnc] >> [3 MWd=PrWd Lin-IO:Lex]
74	Inc w/o Agr	V incorporation without agreement	(asp) (V+D$_\sigma$+V)	(asp) (V) (D$_{\sigma\sigma}$) (V)	[1 Dep-IO(Node) *agr$_{asp}$ *agr$_{sbj}$ Lin-IO:Fnc] >> [2 V=MF_MWd(agr$_{sbj}$) V=MF_MWd(asp) MWd=PrWd]
68	Cond Inc D	Incorporate D only if incorporate V2	(asp) (V+D$_\sigma$+V)	(asp) (V+D$_{\sigma\sigma}$+V)	[1 Dep-IO(Node) *agr$_{asp}$ *agr$_{sbj}$ Lin-IO:Fnc] >> [2 V=MF_MWd(agr$_{sbj}$) V=MF_MWd(asp)] >> [3 MWd$_{\{label\}}$ Map(Wd_Type)] >> [4 MWd=PrWd]
7	D Label Repair	Bear label {D} to avoid agreement	(sbj+V+D$_\sigma$+V+asp)$_{\{V\}}$	(V+D$_{\sigma\sigma}$+V+asp)$_{\{D\}}$	[1 *agr$_{asp}$] >> [2 Dep-IO(Node) *agr$_{sbj}$] >> [3 MWd$_{\{label\}}$ {V}>{D}]
70	Multiple Labels	Distinct effects when have multiple labels	(asp) (V+D$_\sigma$+V)$_{\{V\}}$	(V+D$_{\sigma\sigma}$+V+asp)$_{\{V\}\{D\}\{ASP\}}$	[1 Dep-IO(Node) *agr$_{asp}$ *agr$_{sbj}$] >> [2 V=MF_MWd(agr$_{sbj}$)] >> [3 *ComplexMWd$_{\{label\}}$ Map(Wd_Type) Lin-IO:Fnc] >> [4 V=WF_MWd(asp) MWd=PrWd]

Table 13

In Grammar 47 No Asp Inc, /asp/ is not incorporated into a surrounding verb and there is no aspect agreement. In Grammar 15 **V Over D,** /V2/ incorporates into the MWd containing /V1/ but the object /D/ is not incorporated. In this type, /V2/ actually incorporates over /D/ resulting in a change in word order. On the surface, therefore, such grammars may be ambiguous to speakers whether they involve this type of post-syntactic incorporation, or syntactic head movement like the one discussed above (Collins' analysis of ǂHoan verb compounds in Section 6.1).

Grammar 74 **Inc w/o Agr** involves the incorporation of /V2/ into /V1/ without the presence of agreement, i.e. an optimal output \ (asp) (V+D+V) \. Such a structure results when constraints requiring verbal inflection (i.e. V=WF_MWD(agr_{sbj}) and V=WF_MWD(asp)) are ranked *below* constraints disallowing these morphemes (i.e. *agr_{sbj} and *agr_{asp}) but *above* a mapping constraint requiring terminal nodes map to MWds (i.e. Map(Wd_Type). In this case, incorporation takes place because it has less violations of the V=WF constraints.

Grammar 68 **Cond Inc D** involves incorporating /D/ only under the conditions that /V2/ is also incorporated, i.e. a non-SVC output \ (asp) (V) ($D_{\sigma\sigma}$) \ but a SVC output \ (asp) (V+$D_{\sigma\sigma}$+V) \. In this case, /D/ is incorporated only if it would otherwise 'get in the way' of V2 incorporating, and not otherwise. The constraint ranking which accounts for this involves ranking the V=WF_MWd constraints and Map(Wd_Type) crucially above MWd=PrWd.

The final two grammars involve morphological labeling, as discussed in Section 5.4. In grammar 7 **D Label Repair**, the optimal output \ (V+D+V+asp)$_{\{D\}}$\ bears a label {D} rather than the label {V} in order to avoid a violation for not bearing agreement. This output is found in grammars 7,14,16,27,29,36,43,45,50,57,59,64. Similarly, grammar 70 **Multiple Labels** involves effects when one of the candidates has multiple labels. In this case when the optimal output candidate has a {V} label, the /asp/ marker surfaces appears in its own MWd, whereas in another derivation the optimal output has {V}, {D}, and {Asp} labels and /asp/ appears at the right edge of this MWd. This output is found in grammars 39,46,53,60,70,77,84,91.

It is unclear at this point whether the last two types of grammars constitute pathological predictions of the constraint set. This is because although candidates were generated systematically along several important dimensions (described in Section 5.2), generating the complete list of candidates with different morphological labels was not feasible for this project. I therefore suspect therefore that these final two grammar types are merely an artefact of the limited number of candidates evaluated in this study with respect to different morphological labels.