

On the autonomy of Fission: Evidence from discontinuous agreement in Semitic

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Abstract. The operation known as *Fission* in Distributed Morphology has figured prominently in accounting for discontinuous agreement in verbal paradigms—that is, the exponence of agreement with a single argument which is distributed over more than one position on the verb. Fission is often seen as a by-product of a composite Vocabulary Insertion mechanism determining which features are split up, where they are linearized, and how they are spelled out. An alternative view which presupposes a modular postsyntax assigns operational autonomy to rules responsible for feature splitting, displacement, and exponence. I argue that the latter approach is empirically superior on the basis of a novel set of allomorphic alternations from Semitic which demonstrate that Fission and displacement feed, and hence cannot be equated with, Vocabulary Insertion. The result is that the inventory of postsyntactic operations must include at least the following three operations: Fission, Metathesis, and Vocabulary Insertion.

Keywords. Morphology; fission; discontinuous agreement; allomorphy; displacement; Semitic

1 Introduction

Fission in Distributed Morphology (DM; Halle and Marantz 1993, 1994) is typically conceived of not as a rule *sensu strictu*, but as a consequence of the way in which Vocabulary Insertion is defined. In the standard case, Vocabulary Insertion selects a single phonological exponent to realize the features of each terminal node, concomitantly ‘discharging’ all features matched by the corresponding vocabulary entry. By hypothesis, discharged features are not available to be realized again (though some authors permit them to be referred to in the contextual specification of subsequent vocabulary entries, see Noyer’s (1992) ‘secondary exponence’). However, when the chosen vocabulary entry matches a proper subset of the features of the terminal node, this view hypothesizes that the left-over features are fissioned off into a separate, subsidiary morpheme, licensing one or more subsequent cycles of Vocabulary Insertion to operate over the unmatched features (see Noyer 1992; Halle 1997; Harley and Noyer 1999; Trommer 1999; Frampton 2002; Trommer 2003a; González-Poot and McGinnis 2006; Embick and Noyer 2007; Harbour 2008a; Campbell 2012; McGinnis 2013; among many others; see Müller 2006, 2007 for a formalization of this view of Fission). In other words, under this account, Fission is reduced to cyclic Vocabulary Insertion at a single node which proceeds until all relevant features of the terminal have been discharged, or until all candidate vocabulary entries have been selected.

An alternative formalization of Fission is proposed in Arregi and Nevins (2012), based on the parallel operation of Fission in phonology proposed in Calabrese (1998) (for conceptual predecessors, see Halle and Marantz 1993 and Calabrese 2003): under this view, Fission is an autonomous, postsyntactic operation logically preceding Vocabulary Insertion which creates two positions of exponence out of a single syntactic terminal. Moreover, Fission rules apply in response to language-specific morphotactic constraints on banned featural coexponence. The basis for this approach is a modular view of postsyntax in which morphological operations are clustered into serially ordered modules.

A crucial difference between the two approaches to Fission thus lies in whether or not certain kinds of morphological rules are assigned an independent status in the grammar—in particular, rules responsible for feature splitting, rules which linearize terminal nodes, and rules which assign phonological exponents to morphosyntactic feature bundles. For theories of Fission based on feature discharge, feature splitting (i.e.

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Fission) is a by-product of a language’s inventory of vocabulary entries and the effects of Fission are collapsed into rules of Vocabulary Insertion. For theories of Fission which presuppose a modular postsyntax, however, Fission rules are autonomous and hence are predicted to interact with other morphological rules through pairwise rule ordering, including feeding and bleeding relations (see, e.g., Kenstowicz and Kisseberth 1979 and Baković 2011 on rule ordering in phonology, and Embick and Noyer 2001 and Arregi and Nevins 2012 on rule ordering in DM).

This paper will argue for the latter approach: Fission (and displacement) rules feed, and hence cannot be equated with, Vocabulary Insertion. Evidence bearing on this conclusion comes from discontinuous agreement in the verbal paradigms of several Semitic languages, some of the very data which inspired the earliest work on Fission in DM (see Noyer 1992 and Halle and Marantz 1993). Discontinuous agreement refers to agreement with a single argument which is expressed in more than one position on the verb. Following Arregi and Nevins (2012), I argue that Fission turns one syntactic terminal into two, splitting up certain targeted features and copying all others into both output nodes. This account provides a straightforward explanation of *impure discontinuities* where discontinuous agreement affixes have overlapping φ -featural exponence (see Harbour 2008a; Nevins 2011a; Campbell 2012). Because the effect of Fission is to create two near identical copies of the input terminal node which differ only in the distribution of the separated features, the fact that certain (copied) features might be exponed more than once at Vocabulary Insertion is unsurprising. This account of impure discontinuities differs from most previous approaches to the problem which systematically analyze multiple exponence as contextual allomorphy. I show, however, that impure discontinuities do not have the typical profile of morphosyntactically conditioned allomorphy.

The second major aim of this paper is to show that true contextual allomorphy is attested in discontinuous agreement. While the details vary from paradigm to paradigm, a key generalization emerges from the data: discontinuous agreement affixes only exhibit allomorphy sensitive to linearly adjacent material in Semitic. Similar linearity-based constraints on allomorphy have been identified in other, unrelated languages (see Embick 2010 and Arregi and Nevins 2012), providing support for the conclusion that the cases at hand instantiate true allomorphy, in contrast to impure discontinuities. The relevance of this discovery is as follows: the form of discontinuous agreement morphemes, typically the product of Fission, must be determined *after* displacement, hence displacement must precede Vocabulary Insertion. Moreover, the linearization of discontinuous agreement affixes presupposes a prior step of Fission; therefore, Fission must precede displacement. This argumentation gives us the following order of postsyntactic operations: Fission \prec Displacement \prec Vocabulary Insertion (where ‘ \prec ’ is to be read as ‘precedes’). My conclusions thus demand that Fission and displacement operations be included in the inventory of available morphological operations which are organized in a modular architecture. Moreover, these data provide additional empirical support that linear adjacency is critical in many cases for determining allomorphy.

The rest of this article is organized as follows. Section §2 introduces two DM formalisms for Fission, one based on Vocabulary Insertion and one based on feature copying prior to realization. Section §3 engages the puzzle of impure discontinuities where a single feature is realized on more than one discontinuous agreement affix. Investigation of impure discontinuities clarifies the set of theoretical positions each Fission analysis is committed to regarding the order of post-syntactic operations. In section §4, I present novel evidence from Semitic in favor of a linear adjacency constraint on conditioning allomorphy of discontinuous agreement suffixes, arguing that only theories which admit autonomous Fission rules can adequately square with the full range of variation. Section §5 concludes.

2 Two Formalisms For Fission

In this section, I begin by describing the empirical signature of Fission: the separate exponence of features otherwise expected to be realized by a single vocabulary entry. I then lay out two prominent approaches to Fission in DM. The first is arguably the standard view and derives the effects of Fission through procedural aspects of Vocabulary Insertion. The second assigns Fission rules an independent status in the grammar and

relies on a serially ordered set of operations to assemble and expone words postsyntactically.

2.1 The signature of Fission

Fission has typically been invoked in morphological accounts of certain apparent breakdowns in the one-to-one mapping between syntactic nodes and phonological loci of exponence. As a schematic illustration, consider (1). Suppose that there is good reason to believe that the features $[\alpha F_1]$ and $[\beta F_2]$ are bundled in the feature matrix of a syntactic terminal X^0 (indicated here by the valued categorial feature $[CAT: X]$). The empirical puzzle addressed by Fission is that $[\alpha F_1]$ and $[\beta F_2]$ may be realized by separate exponents corresponding to distinct vocabulary entries: $PHON_1$ and $PHON_2$ respectively in (1).

$$(1) \quad \begin{array}{c} \text{Syntax} \\ \left[\begin{array}{c} CAT: X \\ \alpha F_1 \\ \beta F_2 \end{array} \right] \end{array} \longrightarrow \begin{array}{c} \text{Pronounced} \\ PHON_1 \quad \dots \quad PHON_2 \\ \leftrightarrow \left[\begin{array}{c} CAT: X \\ \alpha F_1 \end{array} \right] \quad \leftrightarrow \left[\begin{array}{c} CAT: X \\ \beta F_2 \end{array} \right] \end{array}$$

A key example of this kind of breakdown comes from *discontinuous agreement* in the two primary verbal conjugations of Semitic. These are the prefix conjugation in (2) and the suffix conjugation in (3), illustrated with data from $\text{\textcircled{S}an\text{\textcircled{f}ānī}}$ (/s^ʕanʕa:ni:/) Arabic, a variety of Arabic spoken in the Old City of Sanaa, Yemen and its environs (see Watson 2009).¹

(2) Prefix Conjugation

ti- gambir -u:
2- sit -M.PL
'You (m.pl.) sit.'

(3) Suffix Conjugation

gambar -t -u:
sat -2 -M.PL
'You (m.pl.) sat.'

In the prefix conjugation, subject agreement flanks the verb stem: person as a prefix, and number and gender as a suffix. In the suffix conjugation, subject person and number/gender agreement are linearly adjacent, though the two affixes can still be individuated.² The choice between the two conjugations corresponds to a temporal/aspectual contrast which varies from language to language; the prefix conjugation is typically interpreted as non-past or imperfect, and the suffix conjugation as past or perfect.³

The claim that discontinuous agreement is fundamentally a morphological phenomenon is not uncontroversial, however. Syntactic analyses have been put forward to account for the disparate exponence of φ -features by positing pure person and number probes in the Asp/T domain of the clause.⁴ A cogent formalization of this idea is presented in Martinović (2019), who builds on Shlonsky (1989): heads bearing person, number, and gender probes are argued to project independently along the main functional spine, as shown in (4). The hierarchy of projections "[Pers(on) ... [Num(ber) ... [Gen(der) ...]]" is apparently supported by crosslinguistic implicational generalizations in agreement: verbs inflected for person

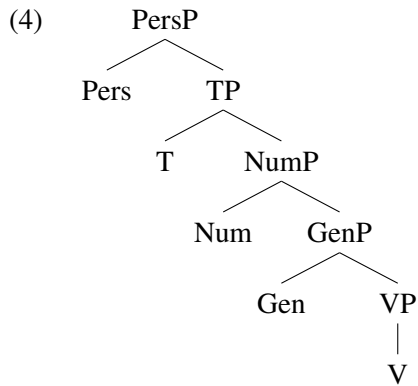
¹I use the term "discontinuous agreement" to cover (i) contiguous and discontiguous agreement, so long as the affixes can be adequately distinguished, and (ii) both 'pure' splits where the two morphemes ostensibly do not overlap in the features they expone as well as 'impure' splits, to be discussed at length below.

²My parsing is supported by the remarkable phonological similarity between the two sets of morphemes. The linearly first person suffix in (3) is /t/ and the person prefix in (2) is /ti/, while both number affixes are /u:/. This similarity is not as systematic for each Semitic language, however, and positing Fission in the suffix conjugation in particular may require independent justification on a language-by-language basis.

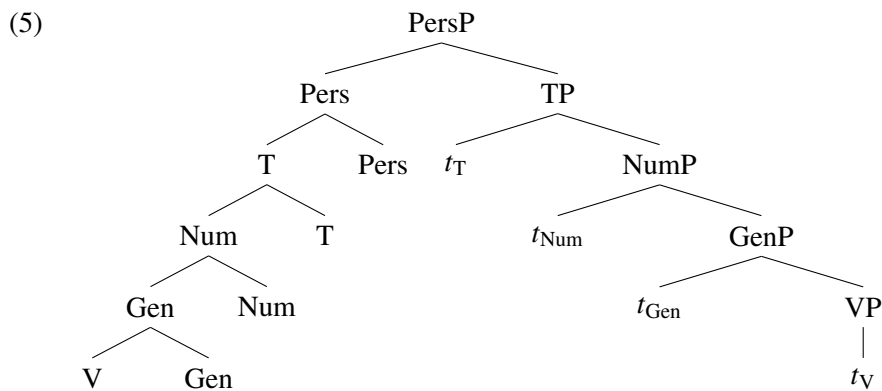
³Akkadian is an exception to this rule: the prefix conjugation is used for preterite, perfect, and imperfect forms of the verb, while the suffix conjugation expresses 'stative' forms which reportedly lack any specific temporal or aspectual value (see, e.g., von Soden 1995: §77).

⁴For related proposals which posit more than one syntactic terminal corresponding to each discontinuous affix in the Semitic verbal conjugations, see Banksira (1999, 2000), Fassi Fehri (2000), Tourabi (2002), Lumsden and Halefom (2003), Lowenstamm (2011) and Bruening (2017: 51–55).

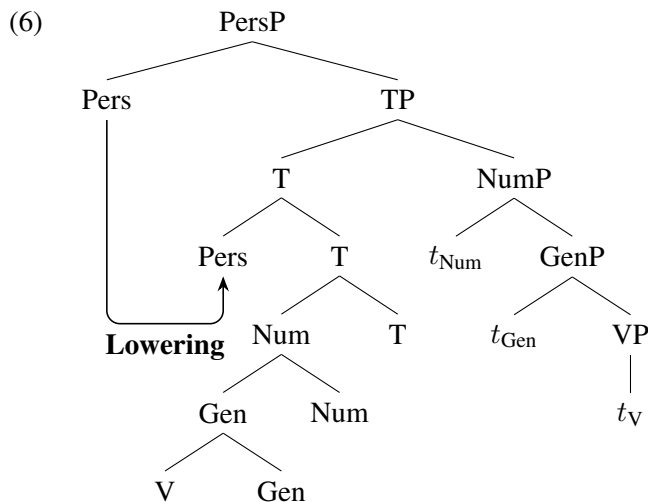
agreement will also be inflected for number agreement, and verbs inflected for number agreement will be inflected for gender agreement. Additionally, T is argued to intervene between Pers and Num on the basis of interactions between tense and agreement in Modern Hebrew (see Shlonsky 1989 for discussion).



In deriving a suffix conjugation form, the verb undergoes successive-cyclic head movement to Pers, as in (5), resulting in fully suffixal subject agreement.



To derive a prefix conjugation verb, Martinović (2019: 35) argues that the verb raises only to T, at which point Pers lowers to T to form a prefix via the DM operation *Lowering* (see Embick and Noyer 2001), as shown in (6). This derivation results in prefixal person agreement and suffixal number/gender agreement.



Syntactic analyses of Semitic discontinuous agreement face at least three non-trivial issues. First, the hierarchy of projections in (4) predicts, via Mirror Principle reasoning (Baker 1985), that number/gender agreement should precede person agreement in suffix conjugation verbs, contrary to fact. Where the two can be adequately distinguished, the order is patently the reverse (see Rose 1996 and Lowenstamm 2011: 171–172). For instance, in Tunis Arabic, the plural suffix *-u* is located outside of the second person suffix *-t*.

- | | |
|--|---|
| <p>(7) a. ktib -t
wrote -2
'you (sg.) wrote'</p> | <p>b. ktib -t -u
wrote -2 -PL
'you (pl.) wrote'</p> |
|--|---|
- (Gibson 2009)

Second, by proposing that person, number, and gender project independently, syntactic analyses predict a one-to-one mapping between φ -features and agreement affixes. They are therefore ill-equipped to accommodate impure discontinuities, to be discussed below, as in (48) where some φ -feature (here, second person) is indexed on both the prefix and suffix.

- (8) ti- xtev -i
2- write -2.F.SG
'you (f.sg.) will write' (Modern Hebrew)

Likewise, syntactic analyses fail to explain why agreement is sometimes *not* discontinuous. In most Semitic languages, agreement is discontinuous only for second and third persons—and then, only for certain numbers/genders—but not for the first person. (9) illustrates plural agreement in the prefix conjugation of Amharic. Note in particular that first person plural agreement is characterized solely by a prefix, while second and third person plural agreement consist of both prefixes and suffixes.

- (9) Amharic plural prefix conjugation, $\sqrt{\text{sbr}}$ 'break' (Leslau 1995: 301)
- | | |
|---|---------------------------|
| | <u>Plural</u> |
| 1 | inni -säbr |
| 2 | ti -säbr- u |
| 3 | yi -säbr- u |

Third, syntactic analyses fall short of explaining why the final landing site of the verb should differ for the prefix and suffix conjugations. Assuming that head movement is feature-driven, this would seem to require positing two distinct “flavors” of Pers: one which attracts the verb in the suffix conjugation and the other which does not attract it in the prefix conjugation. There is to my knowledge no good reason to propose this split among person-marking affixes, especially in view of the significant formal overlap between prefixes and person-marking suffixes across Semitic (see footnote 2). I will henceforth set aside syntactic analyses of discontinuous agreement in light of their shortcomings and pursue a morphological account instead.⁵

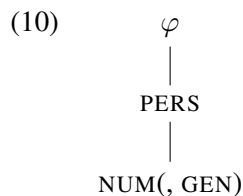
2.2 Fission as iterated Vocabulary Insertion

Broadly speaking, two approaches to Fission have been pursued in the DM literature. The classical view, proposed in Noyer (1992) and Halle (1997) and adopted by most later work, envisions Fission as an ex-

⁵I do not preclude the possibility that φ -features may be distributed among distinct heads in the syntax as the PersonP hypothesis assumes (see also Preminger 2014: 34–35). What I am denying is that discontinuous agreement can be derived simply by ordering these heads (e.g. Pers, Num, and Gen) vis-à-vis the verb stem. My claim is that discontinuous agreement arises as the result of morphological operations, requiring a postsyntactic account. I assume for simplicity's sake that φ -features occupy the feature matrix of a single head in the syntax, though this assumption is not necessary. It is possible, for instance, that several unique φ -bearing heads could be united prior to postsyntactic Fission by *Fusion* of the individual terminals (see Halle and Marantz 1993).

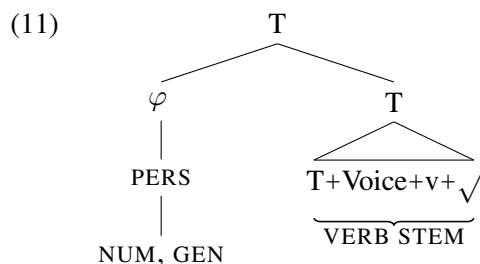
tension of Vocabulary Insertion: Fission is simply iterated Vocabulary Insertion at a single terminal node driven by the availability of underspecified vocabulary entries which can match undischarged features left over from previous cycles of insertion. For the purposes of this paper, I will restrict my attention to the formal mechanism proposed in Harbour (2008a), as it provides an account not only of which features are split up, but also of how those features are linearized.⁶

Harbour’s basic assumptions are as follows. First, φ -features are argued to have internal structure, the pieces of which may be independently manipulated by postsyntactic operations. φ -features are organized as in (10), where φ is a category label and functional head located along the main clausal spine, and PERS(ON) (Harbour’s π) and NUM(BER) (Harbour’s ω) are (syntactic) dependents of that node.⁷ The key aspect of the proposal is that PERS dominates NUM (and, by hypothesis, gender; see Harbour 2007: 241–242).



What distinguishes languages with Fission from those without, then, is that only the former have recourse to vocabulary entries matching sub- φ -trees, e.g. [φ –PERS] or [NUM]. Harbour’s second crucial assumption is that Vocabulary Insertion proceeds bottom-up in a cyclic fashion, as proposed in Bobaljik (2000).

To see how Harbour’s system works in action, let us consider a few representative derivations of prefix conjugation verbs from Modern Hebrew. All of the following examples presuppose the complex head in (11) as the output of the syntactic derivation, including cyclic head movement of the verb to T (see Shlonsky 1989), and as the input to subsequent postsyntactic operations.



Root-out, cyclic Vocabulary Insertion proceeds up the tree until it reaches the φ -node, at which point there are at least two possible ways to realize φ . When the entire φ -structure is matched by a single

⁶I set aside the slightly updated version in Harbour (2016) which revises the analysis in line with Mirror Theory (see Adger et al. 2009), as it involves several assumptions, the precise exposition of which are beyond the scope of this paper. Related proposals whose technical details differ from those of Harbour (2008a) but which proceed on the basis of similar assumptions about the nature of Fission and Vocabulary Insertion are given in Campbell (2012) and McGinnis (2013).

I should note that Noyer (1992) and Halle (1997) do account for the linear order of fissioned morphemes, though in a somewhat different manner than Harbour (2008a). Noyer (1992: 39, 90) and Halle (2000: 137) propose language-specific morphological well-formedness conditions, stated in terms of templatic requirements on verbs requiring, e.g. prefixes and/or suffixes. Halle (2000: 136) also specifies idiosyncratically for each vocabulary entry whether it is a prefix or a suffix.

⁷Harbour’s commitment to the subtree in (10) being truly syntactic—in contrast to the extra-syntactic feature geometries of Harley and Ritter (2002) and McGinnis (2005)—stems from two facts. First, discontinuous agreement (which his analysis is tailored to explain) exhibits a strong “person left, number right” ordering tendency across several unrelated languages (see Trommer 2003b; Campbell 2012). This generalization, according to Harbour (2008a: 192), “must be syntactic at root”, though in the end his explanation of the generalization is fundamentally postsyntactic. The second reason Harbour maintains that the structure of φ -features is necessarily syntactic is that the presence of person agreement on verbs in Romance, Semitic, and Russian correlates with a syntactic phenomenon: the height of verb movement (see Shlonsky 1989 and Pollock 1989).

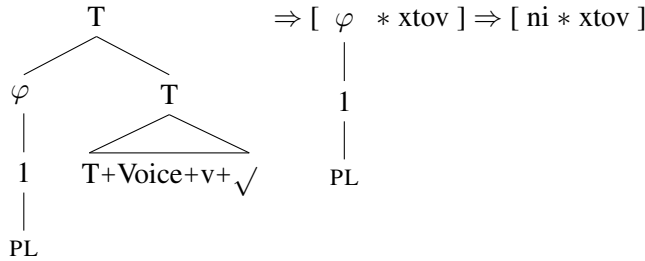
exponent, agreement is realized as a monomorphemic prefix, because “the syntactic sisterhood relation is...transformed into one of linear adjacency” (2008a: 189).⁸ This is shown in (14) for the first person plural verb in (12): the vocabulary entry in (13) will match the features $[\varphi-1-PL]$ with the exponent /ni/, which is linearized to the left of the verb stem, since φ is sister to T. I deviate from Harbour slightly and use asterisks to indicate immediate linear precedence (see Embick and Noyer 2001).

- (12) ni- xtov
1.PL- write
‘we will write’ (Modern Hebrew)

- (13) Modern Hebrew: vocabulary entry for 1.PL future agreement

$$\left[\begin{array}{c} \varphi \\ | \\ 1 \\ | \\ PL \end{array} \right] \leftrightarrow ni$$

- (14) Modern Hebrew: derivation of 1.PL future agreement (*background assumption: Fission is iterated Vocabulary Insertion*)



On the other hand, when multiple sub- φ -structures are matched at Vocabulary Insertion, multiple corresponding exponents are inserted to discharge complementary sets of agreement features. Consider the incomplete derivation in (17) for the second person plural Modern Hebrew verb in (15). The vocabulary entries in (16) will match the features $[\varphi-PERS]$ and $[NUM]$ with the exponents /ti/ and /u/, respectively, together exhaustively realizing the φ -set.⁹

- (15) ti- xtev -u
2- write -PL
‘you (pl.) will write’ (Modern Hebrew)

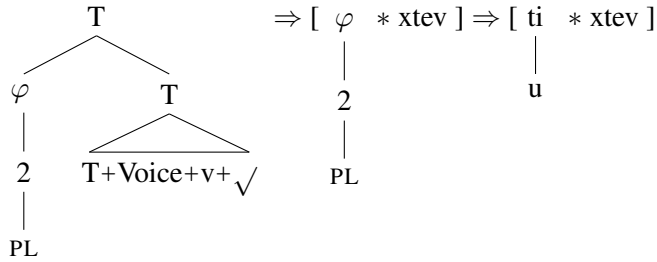
- (16) Modern Hebrew: vocabulary entries for 2.PL agreement

$$\begin{array}{ll} \text{a.} & \left[\begin{array}{c} \varphi \\ | \\ 2 \end{array} \right] \leftrightarrow ti \\ \text{b.} & [PL] \leftrightarrow u \end{array}$$

- (17) Modern Hebrew: derivation of 2.PL agreement (*to be completed; background assumption: Fission is iterated Vocabulary Insertion*)

⁸ As far as I can tell, the analysis is incomplete insofar as Harbour’s stipulation about linearization says nothing about the relative ordering between φ and T. What is required is an algorithm to ensure that φ precedes the verb stem in T (see, e.g. Arregi and Nevins 2012: 60 for such a formalization for linearization in Basque words, as well as example (31) below).

⁹ In (15), I abstract away from stem internal syncope ($xtov \rightarrow xtv$) which feeds epenthesis of an [e] vowel ($xtv \rightarrow xtev$), on which see Faust 2019. This process is triggered by the presence of the plural suffix -u.



Harbour addresses the empirical puzzle presented by (1) by supposing that multiple vocabulary entries are in principle available to be inserted at a single syntactic node in a language like Hebrew. “Fission”, under his analysis, is simply a consequence of the way in which Vocabulary Insertion is defined. Harbour thus does away with the familiar templatic assumption from DM that each terminal node receives at most a single exponent.

Once Vocabulary Insertion has determined that there are multiple agreement affixes in play in a given derivation, Harbour also provides an explanation as to how each affix is linearized. At the final derivational step in (17), the hierarchically highest exponent in the φ -structure *ti-* has been linearized as a prefix on the verb stem. This is because *ti-* realizes φ and φ is sister to T; the lower exponent *u*, however, remains unlinearized. In response to this problem, Harbour proposes that two constraints preserve structural relations during linearization. The first states that linearization must preserve previously established linear adjacency relations. This will rule out a form like **ti-u-xtev*, since such a form would disrupt the adjacency relation between *ti-* and *xtev*. Second, drawing inspiration from Kayne’s (1994) *Linear Correspondence Axiom*, Harbour proposes that linearization must map dominance relations among φ -features onto linear precedence relations. This rules out the form **u-ti-xtev*, because *ti* dominates *u* in the φ -structure and therefore must precede it. The only possible way forward in (17), then, is to displace *u* to the right edge of the word, as shown in (18).

- (18) Modern Hebrew: derivation of 2.PL agreement (*completed*; *background assumption: Fission is iterated Vocabulary Insertion*)

$$\begin{array}{c}
 [\text{ti} * \text{xtev}] \\
 | \\
 u
 \end{array}
 \Rightarrow [\text{ti} * \text{xtev} * u]$$

This has the important consequence that person will be linearized to the left of number by virtue of the internal structure of φ -features and the nature of linearization. Harbour straightforwardly derives the crosslinguistic generalization, illustrated by the data in (19), that person tends to precede number when the two can be adequately distinguished (see Trommer 2003b).

- (19) “Person left, number right” generalization in discontinuous agreement (Harbour 2008a: 185)

- a. yi- zrəq -û
3- throw -M.PL
‘They will throw’ (Biblical Hebrew; adapted from Halle 1997: 432)
- b. v- c’er -t
1- write -PL
‘We write’ (Georgian; Hewitt 1995: 200)
- c. Suek Bostonea s- ixus -e -n
you.PL to Boston 2- go -PL -PST
‘You all were going to Boston’ (Ondarru Basque; adapted from Arregi 1999: 249)

- d. ma -rna -n -panya
 AUX -1EX -2 -PL
 ‘We [verb] you’ (Walmartjari; Hudson 1978: 200)

To summarize, Harbour’s analysis retains the classical intuition that Fission is nothing more than a special case of iterated Vocabulary Insertion, licensed by the availability of more than one vocabulary entry to realize disjunct sets of features on a single terminal node.¹⁰ Vocabulary Insertion and Fission then give way to a linearization algorithm which must ultimately preserve dominance and adjacency relations throughout the derivation. Crucially, vocabularization of the plural exponent *-u* in (18) must precede (or coincide with) displacement, since displacement functions as a ‘Last Resort’ in response to an otherwise unlinearizable structure.¹¹ This prediction is summed up in (20):

- (20) **Postsyntactic rule ordering** (*background assumption: Fission is iterated Vocabulary Insertion*)
 Fission, Vocabulary Insertion \prec Displacement

2.3 Fission as an autonomous rule

I argue for an altogether different approach to Fission building on the work of Arregi and Nevins (2012) which provides a better account of discontinuous agreement in Semitic. My analysis proceeds from the hypothesis that Spellout consists of a set of serially ordered modules. Fission, displacement, and Vocabulary Insertion, among others, are taken to be logically distinct operations applying at different stages of the post-syntactic component. Specifically, I assume the order of operations in (21) where Fission feeds displacement and displacement feeds Vocabulary Insertion, an order which I justify at length later in this paper.¹²

- (21) **Postsyntactic rule ordering** (*background assumption: Fission is autonomous*)
 Fission \prec Displacement \prec Vocabulary Insertion

I propose that Fission is an operation which creates additional positions of exponence out of a given syntactic input.¹³ The mechanics of this operation are illustrated in (22): Fission takes as its input a node

¹⁰This scenario differs from the classical competition among vocabulary entries assumed in the DM conceptualization of Vocabulary Insertion because the vocabulary entries invoked in Fission will not match the same contexts via the *Subset Principle* (see Halle 1997 and Arregi and Nevins 2012: 117). For instance, *ti-* matches [φ -2] in (17) and hence will not compete for insertion at the NUM node; therefore, the vocabulary entries for *ti-* and *-u* will not compete.

¹¹Crucially, Harbour states that linearization and vocabularization happen simultaneously, and in fact represents linearization of the φ subtree vis-à-vis the verb stem as *preceding* vocabularization, a property which I have retained in the preceding derivations. However, in a derivational theory of grammar, it is unclear how simultaneity can be accommodated. Regardless, the important point is that displacement of lower features in the φ subtree occurs at least as late as Vocabulary Insertion.

¹²In terms of Arregi and Nevins’ (2012) modular architecture, Fission operations occur in the *Exponence Conversion* module which precedes the *Linear Operations* module where displacement operations are handled, which in turn precedes Vocabulary Insertion.

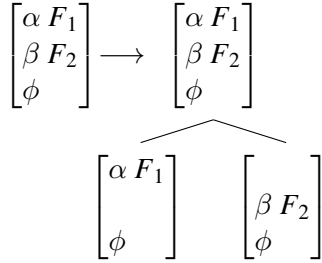
¹³I can see two possible ways to formalize this view of Fission. In the first, Fission *selectively copies* features from the input node into two nearly identical output nodes. The second approach views Fission as a composite, two-step operation. First, the input is *fully copied* into two identical output nodes (see Calabrese 2003 for an early precedent to this view). Subsequently, the output nodes are subject to *selective deletion* of features (possibly akin to Impoverishment). One source of data which might bear on the choice between these two approaches comes from Fission in the independent forms of Algonquian recently discussed by Oxford (2019). In these forms, the prefix and central ending—both of which Oxford argues realize T—index agreement with the same argument. However, there is no full split among φ -features; the prefix consistently marks (some aspect of) person features of the agreed with argument, while the central suffix marks both person and number of that argument. This is shown in (i) for first person plural exclusive agreement in Ojibwe.

- (i) **ni-** waapam -aa **-naan** -ik
 1- see -3.OBJ -1.PL -AN.PL
 ‘we see them’

(Ojibwe; Oxford 2019: 9, citing Nichols 1980: 289)

bearing at least two features $[\alpha F_1]$ and $[\beta F_2]$ and splits these two features up into two output nodes, copying all orthogonal features ϕ in the process. I will refer to the copying nature of Fission as its *feature preservation* component, stated in (23). Features to be split up by a Fission rule—in this case, $[\alpha F_1]$ and $[\beta F_2]$ —are said to be *targeted* by that rule.

(22) **Structure of a morphological Fission rule**



(23) **Feature preservation under Fission**

Orthogonal features ϕ are copied into both output nodes in Fission.

I assume that Fission spawns two daughter nodes below the input, thereby maintaining a binary branching structure in the postsyntax (cf. the ternary branching structure proposed in Halle and Marantz 1993: 171, n. 7). For simplicity, I will only list the category of the mother in the output of Fission rules henceforth.

Observe that unlike in Harbour's analysis, the schematic rule in (22) makes no reference to vocabulary entries: Fission is completely independent of—and indeed logically precedes—Vocabulary Insertion. Fission is driven by language-specific morphotactic constraints on featural coexponence. These triggering constraints encode postsyntactic markedness in the grammar and motivate the separation of the features in conflict— $[\alpha F_1]$ and $[\beta F_2]$ in (22)—prior to Vocabulary Insertion via Fission (or else by another repair, e.g. Impoverishment). Recall in this regard that subject agreement in most Semitic languages is discontinuous in the second and third persons, but remains unfissioned in the first person. This split is exemplified by the paradigms in (24) and (25) for the Ṣanṣānī Arabic verb $\sqrt{\text{gmbr}}$ 'sit'; unfissioned first person forms have been boxed for convenience.

(24) Ṣanṣānī Arabic prefix conjugation

	SG	PL
1	ʔa-gambir	ni-gambir
2M	ti-gambir	ti-gambir-ū
2F	ti-gambir-ī	ti-gambir-ayn
3M	yi-gambir	yi-gambir-ū
3F	ti-gambir	yi-gambir-ayn

(25) Ṣanṣānī Arabic suffix conjugation

	SG	PL
1	gambar-t	gambar-nā
2M	gambar-t	gambar-t-ū
2F	gambar-t-ī	gambar-t-ayn
3M	gambar	gambar-ū
3F	gambar-at	gambar-ayn

(Watson 1993: 56)

The presence of discontinuous agreement throughout the second and third persons is clearest in the prefix conjugation paradigm in (24): second feminine singular agreement in the prefix conjugation is realized by both a prefix and a suffix (i.e. **ti-gambir-ī**), and all second and third person plural agreement is discontinuous. I take this as evidence that Fission applies uniformly for second and third person agreement, though many cases involve null morphemes by hypothesis (e.g. **yi-gambir-∅** 'he sits').

This systematic overlap could be explained if the selective deletion mechanism of Fission were to only delete the feature [−singular] from the prefix, leaving the central ending featurally intact and therefore fully specified for person and number with respect to the input. I leave the matter of deciding between these (and other) alternatives for the future.

Similar person-based splits are evident in the exponence of Basque clitics, as detailed by Arregi and Nevins (2012: 132–136). Basque has a dedicated plural clitic *-e* which appears in addition to a strict person-marking clitic in the second and third persons; the first person plural, however, does not exhibit fission. This is shown below for the Lekeitio variety.¹⁴

(26) Lekeitio (Basque) pronominal clitics (adapted from Arregi and Nevins 2012: 122)

	Absolutive	Ergative	Dative
1SG	n-	-t/-da	-t/-da
1PL	g-	-gu	-ku
2SG	s-	-su	-tzu
2PL	s-...-e	-su-e	-tzu-e
3SG	—	-Ø/-o	-ko/-tz
3PL	—	-Ø-e/-o-e	-ko-e/-tz-e

Fission in Basque therefore operates over second and third person *plural* clitics, in contrast to Semitic agreement which evinces a split in the second and third person irrespective of number.

In order to account for the restriction of Fission to second and third persons in Semitic, I propose the morphotactic constraint in (27) as the postsyntactic trigger for the general Semitic Fission rule in (28) (features targeted by Fission are boxed throughout for ease of reference). I adopt the following binary features for the remainder of my analysis: [\pm author] and [\pm participant] to distinguish three persons (Halle 1997), [\pm singular] to distinguish singular from plural number (Harbour 2008b), and [\pm feminine] to distinguish masculine from feminine gender.¹⁵

(27) **Morphotactic constraint triggering non-author Fission**

*[\neg author, α singular]

¹⁴I leave aside the possible parallel from Kartvelian languages such as Georgian, many of which only exhibit splitting in the second and third persons to the exclusion of the first person, as it is not clear *a priori* whether the morphemes involved originate from a single underlying head. For recent attempts to capture the Kartvelian data without recourse to Fission, see Blix (2016, 2020), Bondarenko and Zompì (2020) and Socolof (2020), and for an analysis of Georgian agreement based on the classical view of Fission as iterated Vocabulary Insertion, see McGinnis (2013).

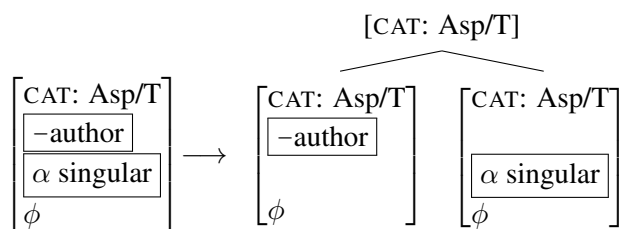
¹⁵The rule in (28) is defined to operate on nodes of category [CAT: Asp/T], though this is probably too strong. As Lumsden and Halefom (2003: 322–325) and Harbour (2016: 157) point out, strong pronouns in Semitic can largely be decomposed along the same lines as subject agreement, prompting a similar Fission-based analysis. My segmentation in (i) illustrates this point for Modern Standard Arabic: all second person forms consist of an invariant [+participant] pronominal stem *?an-*, followed by the 2nd person exponent *-t-* (cf. the second person *t* affixes in (24) and (25)) and a number/gender marking suffix, which in many cases overlaps with the corresponding third person suffix. Likewise, third person pronouns all begin with a pure person marking exponent *h-*, followed by number/gender components.

(i) Modern Standard Arabic strong pronouns

Person	Singular	Dual	Plural
1	<i>?an-a:</i>	<i>naḥnu</i>	<i>naḥnu</i>
2M	<i>?an-t-a</i>	<i>?an-t-um-a:</i>	<i>?an-t-um</i>
2F	<i>?an-t-i</i>	<i>?an-t-um-a:</i>	<i>?an-t-un-na</i>
3M	<i>h-uwa</i>	<i>h-um-a:</i>	<i>h-um</i>
3F	<i>h-iya</i>	<i>h-um-a:</i>	<i>h-un-na</i>

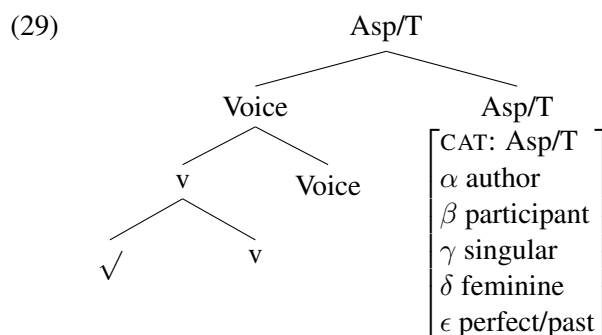
I will nonetheless retain the too-specific definition in (28) since I am strictly concerned with Fission in the verbal domain, though nothing in the analysis precludes extensions to other categories.

(28) **Semitic non-author Fission rule**



The effect of Fission is to redistribute the features [-author] and [α singular] into two discrete positions of exponence and to ‘pied pipe’ all orthogonal features ϕ in the process (see Nevins 2011a). Crucially, since this rule makes reference to the feature [-author], its scope will be restricted to non-first persons.¹⁶ As Arregi and Nevins (2012: 133, fn. 28) observe, this is a strength of the present approach to Fission: we can easily capture the generalization that splitting targets natural classes, a fact left unexplained by a vocabulary-centric approach to Fission.

We are now in a position to see how the present account derives the basic distinction between fissioned and unfissioned agreement in Semitic. I will henceforth assume that successive-cyclic head movement of the verb to T or Asp—a point of variation across Semitic—produces the left-branching complex head in (29) as the input to postsyntactic operations (for evidence of verb raising in Semitic, see Shlonsky (1997) and ? for Modern Hebrew, Harbour (2007) and Hewett (2019) for Biblical Hebrew, and Benmamoun (2000) and Aoun et al. (2010) for several Arabic varieties, among others). φ -features are valued on the feature matrix of Asp/T after it has successfully entered into an Agree relation with the most local accessible DP goal with matching valued features (i.e., the subject).



In the case of agreement with a first person DP, Asp/T will remain unaffected by the non-author Fission rule in (28). The structure of a Ṣanʿānī Arabic first person plural suffix conjugation verb is shown in (30), where agreement is located on T.

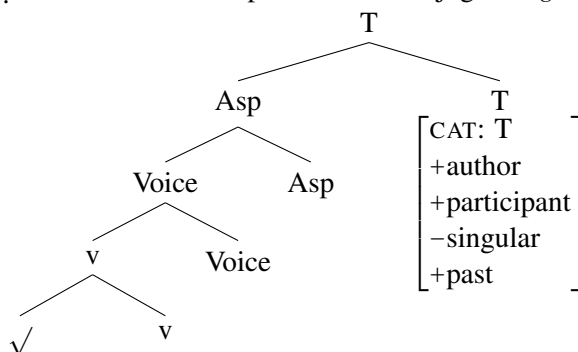
¹⁶North African Arabic is a systematic exception to this rule: first person agreement in these varieties is also discontinuous (see Kaye and Rosenhouse 1997: 293 for data from Marazig Arabic and Maltese).

- | | |
|---------------------------------------|---|
| (i) nə- ktəb
1- write
‘I write’ | (ii) n- kətb -u
1- write -PL
‘we write’ |
|---------------------------------------|---|

(Moroccan Arabic; Aoun et al. 2010: 20–21)

Historically, it appears that the inherited Semitic first person plural prefix *n-* was extended to the singular form in (i), at which point the plural suffix *-u*, previously restricted to second and third persons, was adopted to signal plural number in (ii). Tentatively, I assume that these varieties have generalized the constraint in (27) to ban coexponence of all values of the features [\pm author] and [\pm singular] (i.e. * $[\alpha \text{ author}, \beta \text{ singular}]$). Hence, Fission will apply with all persons in these dialects.

- (30) Ṣanṣānī Arabic: first plural suffix conjugation *gambar-nā* ‘we sat’ (sat-1.PL)



I assume that gender features are deleted from Asp/T early in the postsyntactic derivation via an *Impoverishment* rule (see Bonet 1991; Halle 1997), as gender is systematically neutralized in verbal agreement and pronominal paradigms throughout Semitic in the context of first person features—in other words, gender neutralization in the first person is a *metasyncretism* (Harley 2008). Thus, gender is omitted from the feature matrix on T in (30).

This complex head is linearized according to the general linearization algorithm in (31), modeled after a similar rule for Basque given in Arregi and Nevins (2012: 60, (27)).

- (31) Linearization in Arabic words

In a binary branching node x with daughters y and z where y is the head of x , z precedes y .

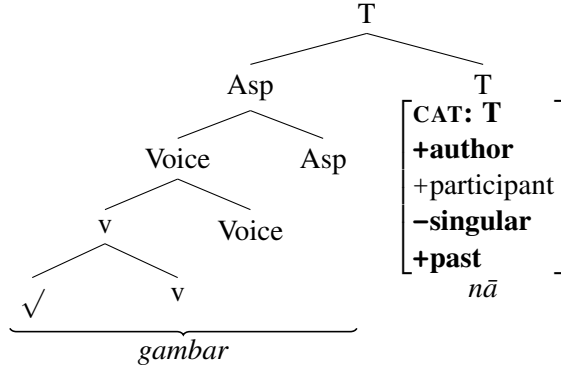
The result is that the terminals are linearized from left to right, with agreement at the far right edge of the word. The vocabulary entry in (32) then matches a subset of features on T—set in boldface—at Vocabulary Insertion and inserts the single exponent *-nā*.¹⁷ See Arregi and Nevins (2012: 112–119) on the role of category features in Vocabulary Insertion. I abstract away from how the verb stem is realized; see Kastner and Tucker (2019) for recent approaches to non-concatenative morphology.

- (32) Ṣanṣānī Arabic: vocabulary entry for 1.PL past agreement

$$\left[\begin{array}{l} \text{CAT: T} \\ +\text{author} \\ -\text{singular} \\ +\text{past} \end{array} \right] \leftrightarrow n\bar{a} \text{ (1.PL)}$$

¹⁷Throughout this paper, I specify tense features in the vocabulary entries for Semitic agreement affixes. Although this might be redundant in the case of Ṣanṣānī Arabic, where there is significant overlap between the exponents of the prefix and suffix conjugation affixes (see shown by (24) and (25)), there is considerable variation in this respect across the Semitic language family. In order to maintain a certain level of abstraction in my analysis, I have chosen to overspecify all of the vocabulary entries for tense/aspect.

(33)



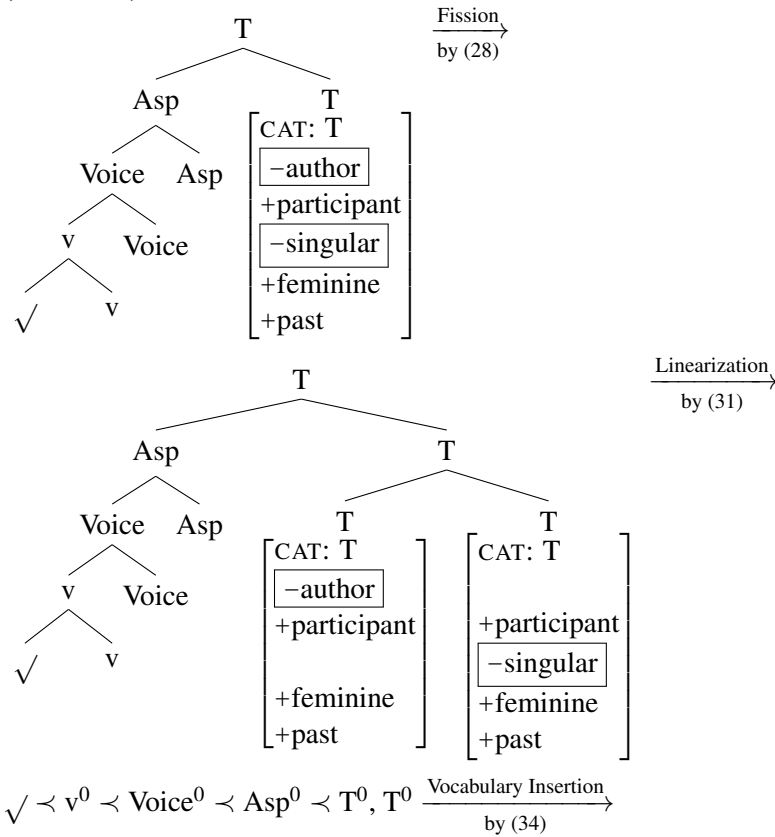
In the case of second or third person agreement, however, non-author Fission will apply. This is illustrated in (35) for a second feminine plural verb with the relevant vocabulary entries for T in (34).

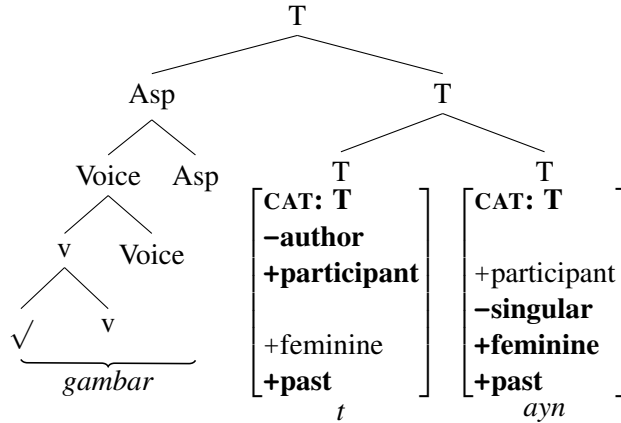
(34) Ṣanṣānī Arabic: vocabulary entries for 2.F.PL past agreement

a. $\begin{bmatrix} \text{CAT: T} \\ -\text{author} \\ +\text{participant} \\ +\text{past} \end{bmatrix} \leftrightarrow t(2)$

b. $\begin{bmatrix} \text{CAT: T} \\ -\text{singular} \\ +\text{feminine} \\ +\text{past} \end{bmatrix} \leftrightarrow \text{ayn (F.PL.)}$

(35) Ṣanṣānī Arabic: postsyntactic derivation of 2.F.PL suffix conjugation *gambar-t-ayn* ‘you (f.pl.) sat’ (sat-2-F.PL)





Non-author Fission creates two T nodes all of whose features are otherwise identical. This feeds the linearization algorithm in (31) which determines that agreement in T must follow the \checkmark -v-Voice-Asp verbal complex. Finally, at Vocabulary Insertion, the vocabulary entries in (34) are selected to insert the exponents *t* and *ayn* in the appropriate T terminals.

One important question which I have not yet addressed is what determines the linear order of fissioned nodes. The rule in (31) fails to impose an order on the two T nodes since both are specified with the categorial feature [CAT: T] and hence neither qualifies as the head of the dominating T node. However, as discussed in relation to (19) above, previous research in this domain has uncovered a strong crosslinguistic generalization in discontinuous agreement: person-marking morphemes tend to precede number-marking ones. This is precisely what we find in Semitic: *t* which expones [-author, +participant] precedes *ayn* which expones [-singular] in (35). Arregi and Nevins (2012) encode this as a templatic requirement on fissioned nodes applying during linearization which demands that person clitics must precede number clitics. Yet, this rule is highly language-specific and does not necessarily express the universal flavor of the “person left, number right” order generalization.

A better account of the order of fissioned nodes should rely on basic principles of the architecture of the postsyntax and properties of the features involved. Building on work by Harbour (2008a) and Campbell (2012), I will assume that φ -features have internal structure. I propose that they form an ordered n-tuple represented here as a ‘stack’ of features.¹⁸ In particular, φ -features are organized according to a (potentially context-free) markedness hierarchy: more marked features are represented higher in the stack, encoding both intercategory and intracategory relations among features.¹⁹ Following the observation from work on the PersonP hypothesis that, in at least Semitic, Romance, and Russian, number agreement is possible without concomitant person agreement but not vice versa, I take person to be a more marked category than number (see Shlonsky 1989); hence, person is higher than number.²⁰ I will also assume without further comment that number is more marked than, and therefore occurs higher than, gender, though this decision has no impact on the analysis. Among person features, I assume that [\pm author] is more marked than [\pm participant] (see Noyer 1992: 44–49, 93–94). The full arrangement of features is given in (36).

¹⁸See Georgi 2014, 2017, as well as Abels 2007, 2012, Stabler 2013, Müller 2010, 2014 and the references cited therein, for similar representations of Agree and Merge inducing features.

¹⁹This is not to deny other notions of markedness, however. See, for instance, Arregi and Nevins (2012: 204–205) who represent markedness in a binary feature system by specific values of those features (e.g., the marked value of the feature [\pm author] is ‘+’).

Moreover, as Will Oxford (*pers. comm.*) points out to me, ‘markedness’ could be substituted by other labels here without losing the empirical gains of the analysis. For instance, one might adopt Harbour’s (2008a) notion of ‘semantic abstractness’ to characterize the hierarchy of features in (36): person features are more semantically abstract than number features, etc.

²⁰Support for person being more marked than number might come from Coon and Keine’s (2020) model of Agree. They suggest that, when probing independently, person universally probes before number (see also Béjar and Rezac 2003).

(36) Semitic hierarchy of φ -features

$$\begin{bmatrix} \pm \text{author} \\ \pm \text{participant} \\ \pm \text{singular} \\ \pm \text{feminine} \end{bmatrix}$$

I leave it as an open question for future research whether φ -feature hierarchies like (36) are idiosyncratically determined for each language, or whether some aspects of the order are universal.²¹

Returning to the question of ordering fissioned nodes, I propose that relative markedness of the features targeted by Fission governs the linear order of affixes. Specifically, Fission imposes a partial linear ordering on the output terminals, translating dominance relations from the feature matrix in (36) into linear precedence relations. This component of Fission is formalized in (37).

(37) **Dominance-to-precedence mapping under Fission**

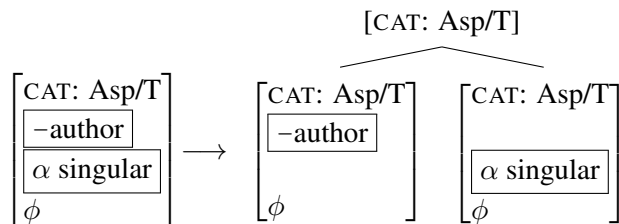
Given two ordered features F_1 and F_2 on the feature matrix of a node C , such that

- a. F_1 and F_2 are targeted by a Fission rule, and
 - b. F_1 is higher than F_2 in the feature matrix of C ,
- ... the output node bearing F_1 precedes the output node bearing F_2 .

The “person left, number right” generalization can accordingly be recast as follows: more marked features are consistently linearized to the left under Fission.²²

Consider once more the Semitic non-author Fission rule in (28), repeated here as (38).

(38) **Semitic non-author Fission rule**



According to (37), the output of Fission will have a (relative) linear ordering—namely, the node bearing [–author] must precede the node bearing [α singular]. By the same logic, we can now explain why the Ṣanṣānī Arabic verb in (35) is *gambar-t-ayn* (sat-2-F.PL) and not **gambar-ayn-t* (*sat-F.PL-2): Fission linearizes the node bearing [–author] to the left of the node bearing [–singular]. Indeed, nothing more needs to be said to derive *all* suffix conjugation forms in Semitic: when Fission applies, the fissioned nodes will be linearized in accordance with (37), and the general linearization algorithm in (31) will fix the order of the remaining terminals.

²¹The ordered stack of φ -features in (36) differs from the feature geometries of Harley and Ritter (2002) and McGinnis (2005) in at least one key respect: feature geometries typically do not accord any direct relationship between person and number features. For instance, in Harley and Ritter’s system, PARTICIPANT (representing person) and INDIVIDUATION (representing gender and number) are direct dependents of the root node REFERRING EXPRESSION. Without additional stipulations, this type of feature geometry cannot encode markedness asymmetries between person and number/gender, and hence will fail to capture ordering generalizations among affixes such as the “person left, number right” generalization. My analysis also contrasts with the language-specific feature hierarchies of Lumsden and Halefom (2003) which govern the order in which vocabulary entries may be selected during Vocabulary Insertion.

²²It is important to note that I am making no predictions about the order *non*-fissioned morphemes; I attribute the “person left, number right” generalization (and the more abstract “marked \prec unmarked” generalization) to a fundamental property of Fission, and not to properties that hold of linearization more broadly.

2.4 Metathesis and linearizing agreement

Having laid out the various details of my proposed mechanism for Fission, the last puzzle to be explained is why discontinuous agreement can sometimes also be *discontiguous*—that is, what predicts the presence of prefixes in prefix conjugation forms like (39)?

- (39) ti- gambir -ayn
 2- sit -F.PL
 ‘you (f.pl.) sit’ (Šanʿānī Arabic)

Given uniform verb movement to Asp/T and the linearization algorithm in (31), the analysis so far would incorrectly predict all agreement to be suffixal, *ceteris paribus*.

In response to this puzzle, I adopt the analysis of morphological *Metathesis* laid out in Arregi and Nevins (2012: chap. 5) using the formalization of Generalized Reduplication proposed in Harris and Halle (2005). The Generalized Reduplication framework was designed to account for instances of full and partial reduplication in morphology, thereby unifying morphological *metathesis* and *doubling*. This is desirable in light of Haspelmath’s (1993) observation that doubling often precedes metathesis in the diachronic “externalization of inflection”.²³ The following brief explication of the Generalized Reduplication formalism draws heavily on the discussion in Arregi and Nevins (2018: 630–632).

Reduplication is argued to involve the repetition of contiguous sequences of elements from the base within a locally defined domain. The domain of reduplication is formally demarcated by double brackets “[...]”. Partial reduplication arises when only some of the copied material is deleted. I follow Arregi and Nevins’ (2018: 630–631) use of angle brackets to indicate the direction and position of deletion, which inverts their usage from the original proposal in Harris and Halle (2005). Note that subsequences to be deleted at an intermediate representation are enclosed in a grey box.

- (40) Partial Reduplication
- a. Repeat all material inside [...]:
 [[A B]] → ABAB
 - b. Delete the material after > in the second copy, doubling of A:
 [[A > B]] → ABA B → ABA
 - c. Delete the material before < in the first copy, doubling of B:
 [[A < B]] → A BAB → BAB

Combining the angle brackets in a single rule gives rise to wholesale metathesis of the targeted sequence.

- (41) Metathesis of A and B
 [[A < B]] → A BA B → BA

Thus, partial reduplication (i.e. doubling) and metathesis differ only in the presence or absence of a single angle bracket.

Returning to the Semitic data, I propose the Metathesis rule in (42) to account for the presence of a prefix throughout the prefix conjugation. This rule takes as its input the output of the linearization algorithm

²³Haspelmath notes, for instance, that the Latin word *ipse* ‘self’ can be diachronically decomposed into a demonstrative *is* which inflected regularly for case, number, and gender, and an invariant suffix *pse*. From Pre-Classical Latin to Classical Latin, however, case morphology gradually migrated outward, first being marked on both the demonstrative stem and on the suffix, and finally only being marked at the right edge of the word.

(i) Pre-Classical Latin *ea-m-pse* (f.sg.acc) > *ea-m-ps-am* > Classical Latin *i-ps-am*

in (31) and Fission, and hence receives a structure whose terminal nodes have already been partly linearized. I follow Arregi and Nevins (2012) and define this Metathesis rule in terms of a structural description and a structural change.

(42) **Semitic prefix conjugation Metathesis**

- a. Structural description: $[T^{0max}/Asp^{0max} \sqrt{v} \text{ Voice } Asp_{[-perf]}/T_{[-past]}]$
- b. Structural change:
 - i. Insert \llbracket to the immediate left of \sqrt{v} , and \rrbracket to the immediate right of Asp/T .
 - ii. Insert $\rangle\langle$ to the immediate left of Asp/T .

The effect of this rule is (i) to copy the verb stem and a right-adjacent Asp/T node specified as $[-perf]/[-past]$, and (ii) to delete the verb in the first copy and Asp/T in the second copy. The presence of the maximal 0-level projection Asp^{0max}/T^{0max} boundary in the structural description ensures that this Metathesis rule will not iterate: once Metathesis has occurred, the verb stem (in particular, the verb root) will no longer be initial within Asp^{0max}/T^{0max} , and the structural description for Metathesis to apply again will not be met.

The fact that an Asp/T prefix is systematically present in the prefix conjugation, regardless of whether the language is robustly head-initial (e.g. Arabic, see (39)) or head-final (e.g. Amharic, see (9)), is captured by the morphotactic constraint in (43).

(43) **Asp/T-initiality**

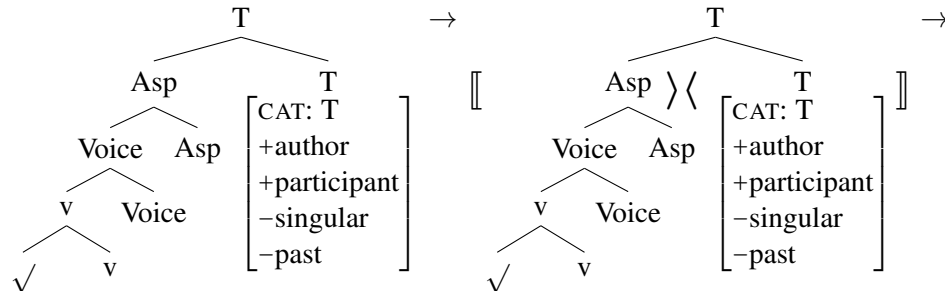
Terminal $Asp_{[-perf]}/T_{[-past]}$ is initial within Asp^{0max}/T^{0max} .

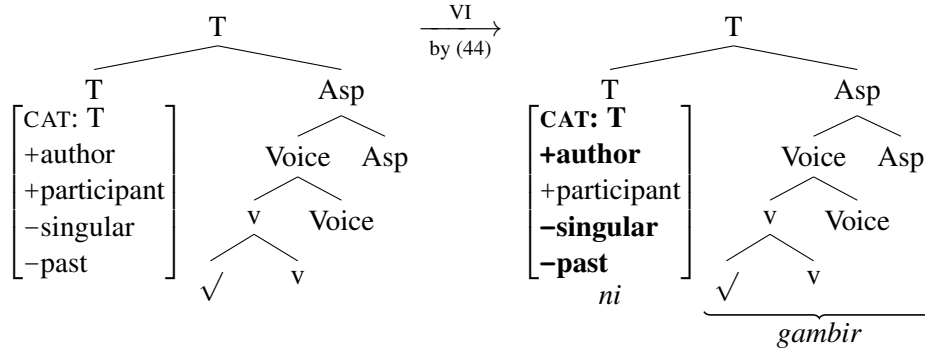
This constraint essentially imposes a templatic requirement that non-past/imperfect verbs in Semitic have agreement prefixes. Thus, prefix conjugation Metathesis will apply regardless of whether or not non-author Fission has previously applied. If Fission has not applied, as in the case of first person plural agreement, Metathesis will simply displace Asp/T bearing φ -agreement to the left of the verb.

(44) **Ṣanṣānī Arabic: vocabulary entry for 1.PL non-past/imperfect agreement**

$\begin{bmatrix} \text{CAT: T} \\ +\text{author} \\ -\text{singular} \\ -\text{past} \end{bmatrix} \leftrightarrow ni \text{ (1.PL)}$

(45) **Ṣanṣānī Arabic: postsyntactic displacement and Vocabulary Insertion of unfissioned T *ni-gambir* ‘we will sit’ (1.PL-sit)**





If non-author Fission has applied, as with second feminine plural agreement, prefix conjugation Metathesis will displace the leftmost terminal Asp/T—determined according to the “dominance-to-precedence mapping under Fission” principle in (37)—to the left of the verb.²⁴

(46) Ṣanṣānī Arabic: vocabulary entries for 2.F.PL non-past/imperfect agreement

- a.

CAT: T

-author

+participant

-past

↔ *ti* (2)

b.

CAT: T

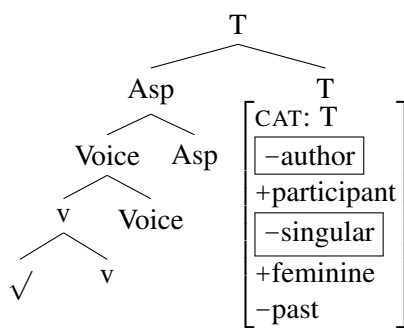
-singular

+feminine

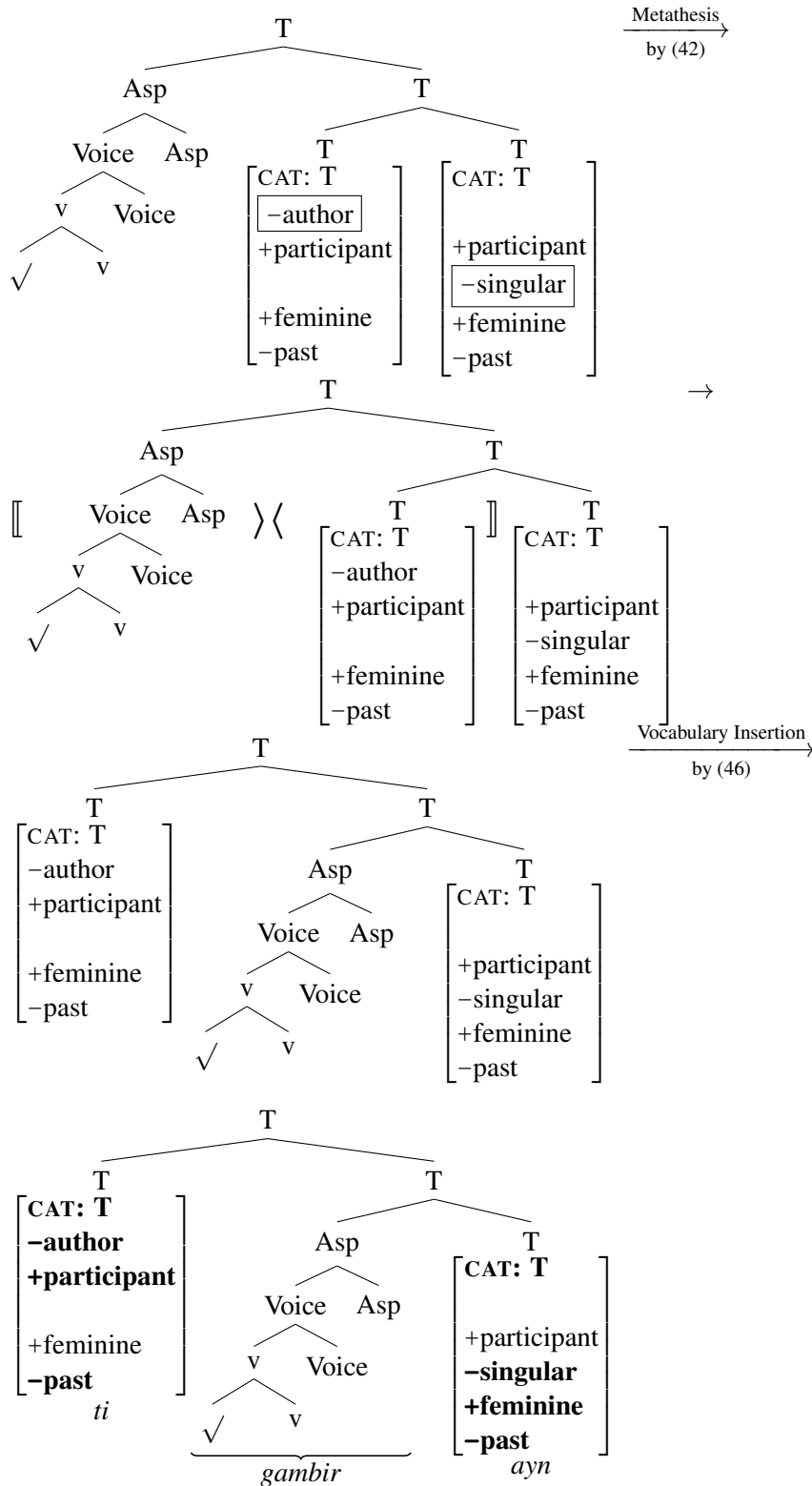
-past

↔ *ayn* (F.PL)

(47) Ṣanṣānī Arabic: derivation of *ti-gambir-ayn* ‘you (f.pl.) will sit’ (2-sit-F.PL)



²⁴I assume that non-terminal T nodes are not targeted by prefix conjugation Metathesis because the triggering constraint in (43) stipulates that a *terminal* Asp or T node is initial within the maximal 0-level projection. Displacing a non-terminal node, such as the mother of the two fissioned nodes, will never satisfy this constraint, and all corresponding postsyntactic derivations are ruled out by hypothesis.



In summary, I am proposing that several autonomous postsyntactic operations interact to derive discontinuous agreement paradigms in Semitic: Fission splits up antagonistic features, Metathesis displaces the leftmost Asp/T terminal bearing φ -agreement in the prefix conjugation, and Vocabulary Insertion realizes the feature bundles. These operations are driven by morphotactic constraints which, e.g., ban the coexpo-

nence of [-author] and [α singular] or which require that non-past/imperfect verbs have agreement prefixes. Fission is additionally constrained by markedness.

This concludes my introduction to the basic mechanics of the two formalisms for Fission. In the next section, I outline how each approach handles so-called “impure discontinuities” (Harbour (2008a); Nevins (2011a)). I will show that, in accounting for multiple exponence in discontinuous agreement, each approach makes strong predictions about postsyntactic rule ordering to be assessed empirically in section §4.

3 Impure discontinuities and the order of postsyntactic operations

A key proving ground for theories of discontinuous agreement comes from the aforementioned case of ‘impure discontinuities’ as in (48). The label ‘impure’ refers to the overlap in φ -features expounded by the two agreement affixes: both the prefix and suffix realize second person features.²⁵

- (48) ti- gambir -ī
 2- sit -2.F.SG
 ‘you (f.sg.) will sit’ (Ṣanṣānī Arabic)

The existence of impure discontinuities is *prima facie* surprising for a theory like Harbour’s in which Fission is licensed by the availability of underspecified vocabulary entries which discharge unmatched features left over from previous cycles of Vocabulary Insertion: how can one set of second person features be realized twice—once by the prefix, and once by the suffix?

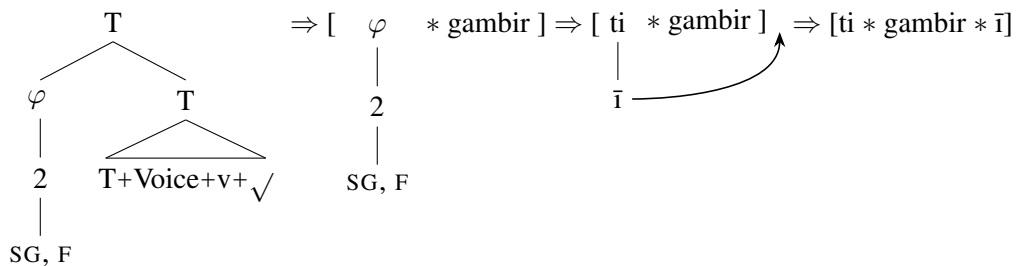
The standard answer given by proponents of the classical ‘Fission as Vocabulary Insertion’ view is that apparent multiple exponence in impure discontinuities is illusory, arising as a result of contextual allomorphy. According to this view, in (48), the prefix *ti-* realizes second person features, while the suffix *-ī* realizes feminine singular features in the context of local (and in Harbour’s case, dominating) second person features. Consider a Harbourian derivation of (48). Root-out, cyclic Vocabulary Insertion and linearization of the complex T head containing the verb proceeds until the φ node is reached. At this point, Vocabulary Insertion matches the sub- φ -structure [φ -2] with the exponent *ti-* which is linearized as a prefix and the structure [SG, F] with the exponent *-ī*. Finally, as a reflex of Harbour’s proposed structure preservation principles, the exponent *-ī* must be displaced to the right of the verb stem.

- (49) Ṣanṣānī Arabic: vocabulary entries for 2.F.SG non-past/imperfect agreement (*background assumption: Fission is iterated Vocabulary Insertion*)

$$\begin{array}{ll} \text{a.} & \left[\begin{array}{c} \varphi \\ | \\ 2 \end{array} \right] \leftrightarrow ti \\ \text{b.} & [\text{SG}, \text{F}] \leftrightarrow \bar{i} / \left[\begin{array}{c} \varphi \\ | \\ 2 \\ | \end{array} \right] \end{array}$$

²⁵The same issue arises in principle with suffix conjugation forms which also exhibit impure discontinuities. However, neither my analysis nor Harbour’s invokes (non-string vacuous) displacement in deriving forms like *gambar-t-ī* ‘you (f.sg.) sat’ (sat-2-2.F.SG). Such forms therefore do not shed light on questions about the interaction between Fission, displacement, and Vocabulary Insertion.

- (50) Ṣanṣānī Arabic: derivation of 2.F.SG non-past/imperfect agreement (*background assumption: Fission is iterated Vocabulary Insertion*)



Crucially, displacement of [SG, F] features independently of the dominating second person features in (50) presupposes prior steps of Fission splitting up the two sub- φ -structures and of Vocabulary Insertion to insert the exponents by the rules in (49). Hence, Fission and Vocabulary Insertion must precede displacement for Harbour. This recalls the predicted rule ordering in (20), repeated here as (51).

- (51) **Postsyntactic rule ordering** (*background assumption: Fission is iterated Vocabulary Insertion*)
Fission, Vocabulary Insertion \prec Displacement

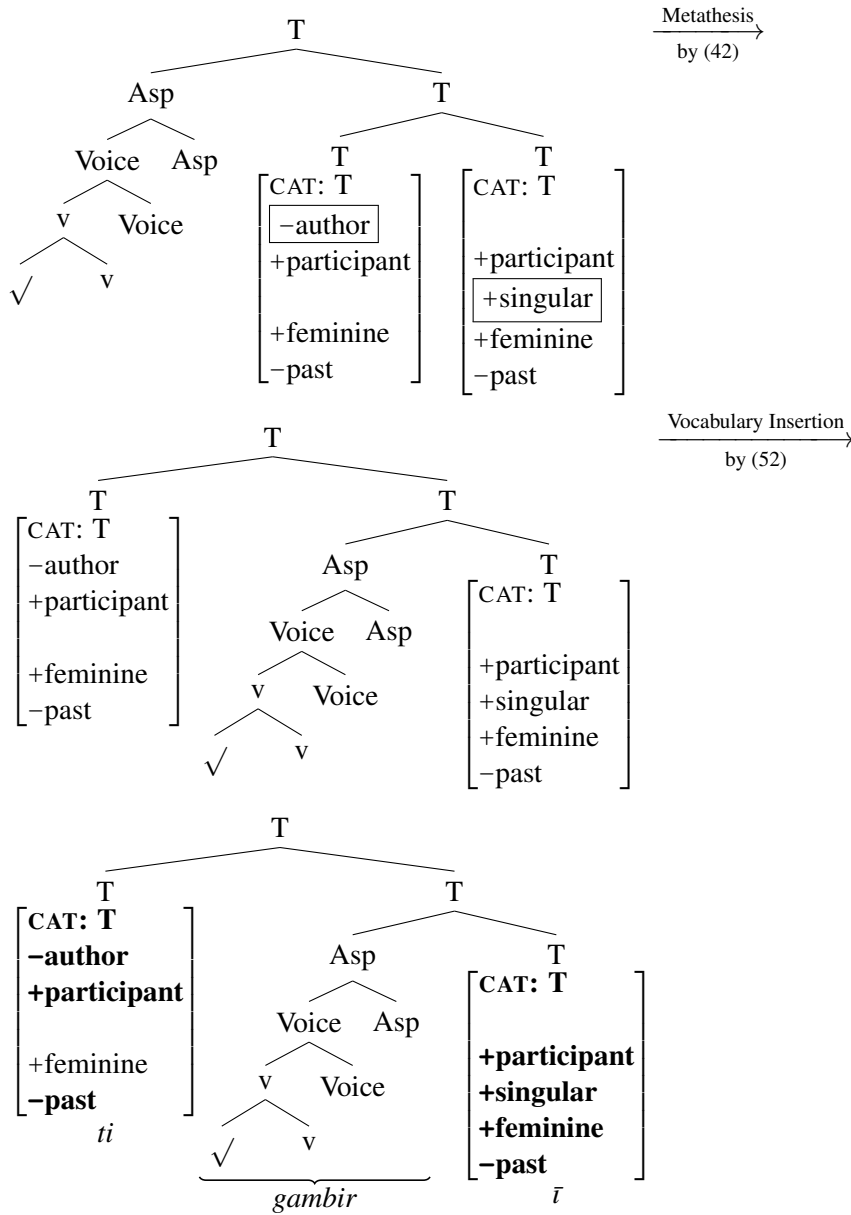
Given Harbour's assumptions about the ways in which agreement is linearized and realized, this makes the following strong prediction: allomorphy of agreement affixes should always be determined prior to displacement at the prefixal position.

By contrast, I argue that impure discontinuities follow naturally from the feature preservation component of Fission stated in (23). By hypothesis, Fission only splits up the features it targets in the input terminal; all other features are copied into both output nodes. It is therefore predicted that a feature copied into both fissioned nodes may be matched in both. Consider how the second feminine singular verb in (48) would be derived under my system. Non-author Fission will split up the features [−author] and [+singular] into two output nodes which inherit all other features of the input, including [+participant]. Prefix conjugation Metathesis then linearly inverts the order of the leftmost fissioned T terminal and the verb to satisfy T-Initiality, and Vocabulary Insertion selects the rules in (52) to realize the fissioned T nodes, as shown in (53). Importantly, the feature [+participant] is matched on both terminals. This gives rise to true featural multiple exponence in impure discontinuities.

- (52) Ṣanṣānī Arabic: vocabulary entries for 2.F.SG non-past/imperfect agreement

$$\begin{array}{ll} \text{a. } \left[\begin{array}{l} \text{CAT: T} \\ -\text{author} \\ +\text{participant} \\ -\text{past} \end{array} \right] \leftrightarrow ti(2) & \text{b. } \left[\begin{array}{l} \text{CAT: T} \\ +\text{participant} \\ +\text{singular} \\ +\text{feminine} \\ -\text{past} \end{array} \right] \leftrightarrow \bar{i}(\text{F.SG}) \end{array}$$

- (53) Ṣanṣānī Arabic: postsyntactic derivation of *ti-gambir-ī* 'you (f.sg.) will sit' (2-sit-2.F.SG) (*background assumption: Fission is autonomous*)



By decoupling Fission from the nature and inventory of vocabulary entries in a given language, I am not committed like Harbour to the view that Fission and Vocabulary Insertion must determine which features are realized where prior to displacement. Rather, I have proposed that Fission feeds Metathesis, which in turn feeds Vocabulary Insertion, as in (54), repeated here from (21).

- (54) **Postsyntactic rule ordering** (*background assumption: Fission is autonomous*)
 Fission \prec Displacement \prec Vocabulary Insertion

Crucially, I propose to conceptually separate impure discontinuities from contextual allomorphy. In doing so, I eschew a somewhat idiosyncratic assumption implicit in Harbour's view: namely, that features within the φ -matrix of a single head can figure in the contextual restriction of vocabulary entries realizing other features on the same terminal. More prototypical cases of allomorphy typically involve interactions between (local) terminals, not between features within the same terminal. As I will show in the next section, true cases of allomorphy in discontinuous agreement are attested, and they are subject to locality restrictions

familiar from what has been discovered in the broader literature on allomorphy.

Before moving on, it is interesting to note that impure discontinuities are a much more general phenomenon than has previously been assumed. Standard cases involve multiple exponence of a single φ -feature category, for instance an impure person or number discontinuity. Insofar as the categorial features of the terminal node are also relevant for conditioning insertion, however, virtually all discontinuous agreement paradigms will involve an impure discontinuity. φ -features are often exponed differently depending on the category of the terminal node across Semitic. For instance, in Biblical Hebrew, the form of second masculine plural prefix conjugation agreement shares little to nothing with the form of the second masculine plural independent pronoun—arguably only the second person /t/ element. Otherwise, the two are formally independent, despite both realizing second masculine plural features.

(55) Biblical Hebrew second masculine plural features

- | | | | |
|----|--|----|-----------------------------------|
| a. | t̪i- šmər -ū
2- will.guard -M.PL
'you (m.pl.) will guard' | b. | ʔattəm
2.M.PL
'you (m.pl.)' |
|----|--|----|-----------------------------------|

I submit that the category-sensitivity of φ -feature exponence follows if categorial features like [CAT: T] are matched in both fissioned nodes at Vocabulary Insertion. This is precisely what I have been assuming in my vocabulary entries and derivations, e.g. in (52) and (53) above. 'Pure discontinuities', should they exist, are predicted to be much rarer, as these would necessarily involve category-insensitive φ -feature exponence. Thus, the issue of accounting for impure discontinuities is multiplied considerably once all the relevant features which condition insertion are taken into account.

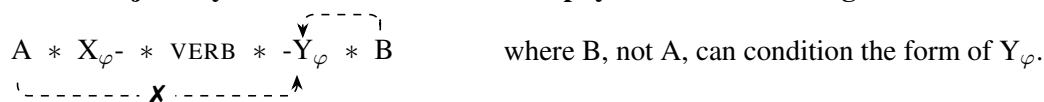
In the following section, I will argue that there is evidence that Fission and displacement must precede Vocabulary Insertion, bearing out my hypothesized order of operations in (54) and opposing Harbour's predicted rule ordering in (51). The evidence comes from considering how linear order restricts the attested patterns of allomorphy in discontinuous agreement. This conclusion directly contradicts the assumption inherent to most previous approaches to Fission—namely, that Fission can be reduced to Vocabulary Insertion. Rather, this provides direct support for the modular view of postsyntax advocated for here.

4 Fission precedes Vocabulary Insertion: adjacency constraints on allomorphy

Recall the two contrasting sets of predictions we have laid out so far. According to Harbour, all subject agreement is underlyingly prefixal. In conjunction with Harbour's linearization algorithm, this accounts for the following two facts: (i) when agreement is discontinuous, person precedes number, and (ii) when agreement is not discontinuous, agreement will be prefixal. In order to account for impure discontinuities, which he analyzes as arising from contextual allomorphy, Harbour predicts that allomorphy must be determined at the prefixal position prior to displacement, at which point the fissioned affixes are sufficiently local to one another. On the other hand, I have proposed that allomorphy should be determined *after* displacement, since impure discontinuities are not actually the product of allomorphy but rather follow from the feature copying component of Fission.

The main empirical contribution of this paper is the discovery of a novel generalization concerning allomorphy in discontinuous agreement: fissioned agreement suffixes only exhibit allomorphy sensitive to surface-linearly adjacent material. This generalization is schematized in (56), where X_φ and Y_φ are discontinuous agreement affixes and A and B are other morphemes:

(56) **Linear adjacency constrains suffixal allomorphy in discontinuous agreement**



Both aspects of the generalization in (56) are missed under Harbour's account. The form of agreement suffixes may be sensitive to material following the verb (i.e. B), but never to material preceding the verb (i.e. A), despite Harbour's contention that suffixes are realized first at the prefixal position. To adequately capture the attested and unattested patterns of allomorphy, Fission and displacement must feed Vocabulary Insertion. In the following subsections, I will demonstrate that several allomorphic alternations from Semitic bear out this generalization. Particularly relevant are cases in which an impure discontinuity (e.g. for person) occurs concomitantly with allomorphy sensitive to linear adjacency. These latter cases are particularly problematic for theories like Harbour's which analyze impure discontinuities as a species of allomorphy, since these theories will always require one of the allomorphic triggers (i.e. X or B in (56)) to be non-local.

4.1 Fission and displacement feed suffixal allomorphy

In Ṣanṣānī Arabic, the feminine plural suffix in both the prefix and suffix conjugations appears as *-ayn* when word-final, but as *-ann* when preceding object clitics.²⁶ This is shown in (57) for third person feminine plural agreement in the prefix conjugation, where agreement morphemes are underlined and the feminine plural suffix is additionally bolded.

- (57) a. yi- št **-ayn**
 3- want -F.PL
 'they (f.pl.) want'
- b. yi- št **-ann** -iš
 3- want -F.PL -2.F.SG.OBJ
 'they (f.pl.) want you (f.sg.)'

(Watson 2009)

I submit that the alternation *-ayn*~*-ann* is not one of monophthongization driven by syllable structure constraints in the language. All else being equal, we would have predicted a sequence *-aynVC* in (57b) (where V and C stand for an unspecified vowel and consonant), since *-aynVC* sequences are attested elsewhere in the language.

- (58) a. bayn-ih
 in-3.M.SG
 'in it'
- b. dayn-ih
 debt-3.M.SG.POSS
 'his debt'

(Watson 2002: 209)

Even more striking is the presence of near minimal pairs between first person plural and third person feminine plural suffix conjugation verbs formed from geminate or final-weak roots, such as $\sqrt{\text{bzz}}$ 'take'. In

²⁶The classic battery of diagnostics to distinguish clitics from affixes presented in Zwicky and Pullum (1983) does not predict this allomorphy to be possible: only affixes are claimed to be able to induce changes in the phonological shapes of their hosts by Zwicky and Pullum's criterion C. However, there is at least some evidence that this test needs to be rethought, given that certain clitic auxiliaries in English, which Zwicky and Pullum themselves treat, license stem allomorphy of the first and second person singular pronouns "I" and "you" (Wescoat 2005).

- (i) a. I [aɪ]
 b. I'll [aɪl] ~ [ɔl]
- (ii) a. you [ju:]
 b. you're [ju:ɹ] ~ [jɔɹ]

Thanks to Jason Merchant (*pers. comm.*) for pointing out these facts to me. I will nonetheless refer to morphemes like *-iš* in Ṣanṣānī Arabic as clitics due to (i) their tense invariance (see Nevins 2011b), (ii) their formal similarity to possessive pronouns (see Kramer 2014: 609–610), and (iii) the fact that they are in complementary distribution with full DP arguments of the verb. Only in clitic left dislocation configurations are DP arguments found with coreferential clitics on the verb (see Watson 1993: 387).

the case of the first person plural, the diphthong /ay/, a stem augment, is preserved before object clitics as shown in (59a). The feminine plural suffix in (59b) nevertheless exhibits the *-ann* allomorph in the same phonological environment (the [a] vowel before the object clitic is epenthetic).

- (59) a. *bazzaynāhā* ~ *bazzaynahā*
 bazz-ay-nā-hā
 take-STEM.AUG-1.PL-3.F.SG.OBJ
 ‘we take her’
 b. *bazzannahā*
 bazz-ann-ahā
 take-3.F.PL-3.F.SG.OBJ
 ‘they (f.pl.) take her’

(Watson 2002: 209)

I will therefore assume that variation in the form of the feminine plural suffix in Ṣanʿānī Arabic is contextual allomorphy triggered by the local presence of an object clitic.²⁷ I propose the vocabulary entries in (60): a T morpheme bearing the features [–singular] and [+feminine] is realized as *-ann* when left-adjacent to a clitic (here represented as D⁰), and as *-ayn* otherwise.

(60) Ṣanʿānī Arabic: vocabulary entries for feminine plural allomorphy

- a. $\left[\begin{array}{l} \text{CAT: T} \\ \text{–singular} \\ \text{+feminine} \\ \text{–past} \end{array} \right] \leftrightarrow \text{ann} / \text{___ D}^0 \text{ (F.PL)}$
 b. $\left[\begin{array}{l} \text{CAT: T} \\ \text{–singular} \\ \text{+feminine} \\ \text{–past} \end{array} \right] \leftrightarrow \text{ayn (F.PL) (elsewhere)}$

The alternation in (57) thus bears out one part of the linear adjacency generalization from (56): the rule mapping phonological content to the features of the suffix must make reference to its surface linear position.

Importantly, the Ṣanʿānī Arabic pattern is not exceptional. At least two other alternations with roughly the same profile come from suffix conjugation forms in Modern Standard Arabic and Biblical Hebrew. In Modern Standard Arabic, second person masculine plural subject agreement is *-tumu:* before object clitics, but *-tum* otherwise.

- (61) a. katab -tum
 wrote -2.M.PL
 ‘you (m.pl.) wrote’
 b. katab -tumu: -ha:
 wrote -2.M.PL -3.F.SG.OBJ
 ‘you (m.pl.) wrote it (f.sg.)’

There is no general process of final long-vowel reduction in Modern Standard Arabic which would motivate the loss of /u:/ in (61a), as evinced by second (and third) person plural subjunctive and jussive prefix conjugation forms of the verb, as shown by (62).

- (62) li- ta- ktub -u:
 in.order- 2- write.SUBJ -M.PL
 ‘in order for you (m.pl.) to write’

²⁷Watson (2002: 208–210) demonstrates that the diphthong reduction manifest in examples like (57) is unlike the more general process of /ay/→[a] reduction in feminine plural subject suffixes and in several function words and linking verbs in a variety of contexts in Arabic dialects. The latter, she argues, is motivated partly by syllable structure requirements. Though Watson recognizes the lexical idiosyncrasy of the feminine plural alternation *-ayn*~*-ann*, her ultimate explanation invokes moraic (de)linking and syllabification—strictly prosodic/phonological operations—which must make reference to morphological information to ensure that this process will not apply in cases like (58). I diverge from Watson’s account and elect to analyze the Ṣanʿānī Arabic feminine plural alternation as involving two distinct exponents, rather than a single exponent and multiple phonological rules which are sensitive to morphological information.

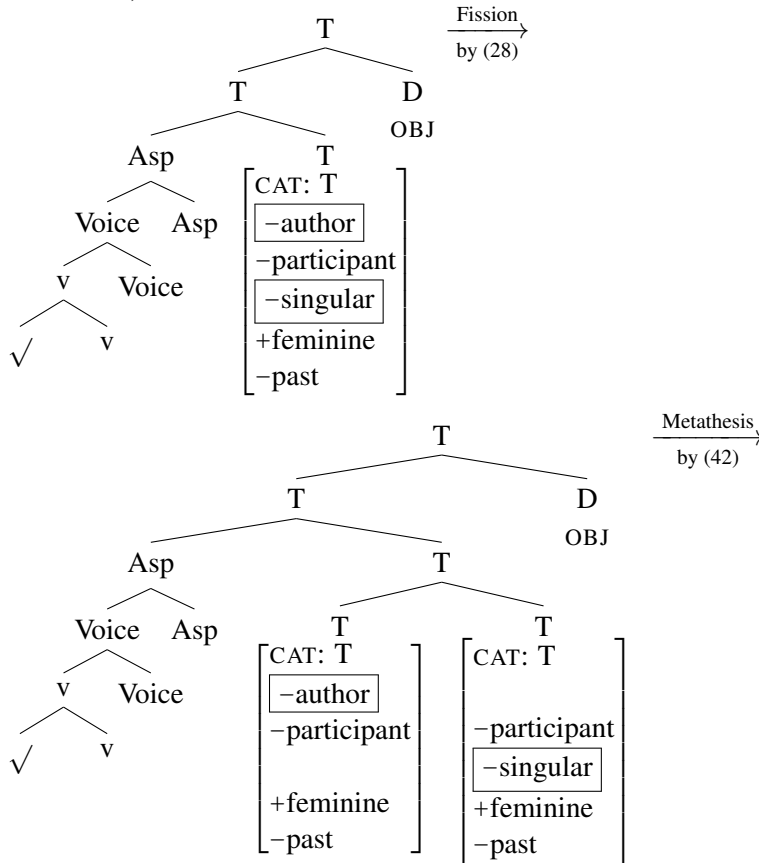
Likewise in Biblical Hebrew, though the pre-clitic allomorph is vanishingly rare, arguably an accident of the textual record. Second masculine plural agreement in the suffix conjugation is normally *-tem*, but before object clitics, it appears as *-tū*.

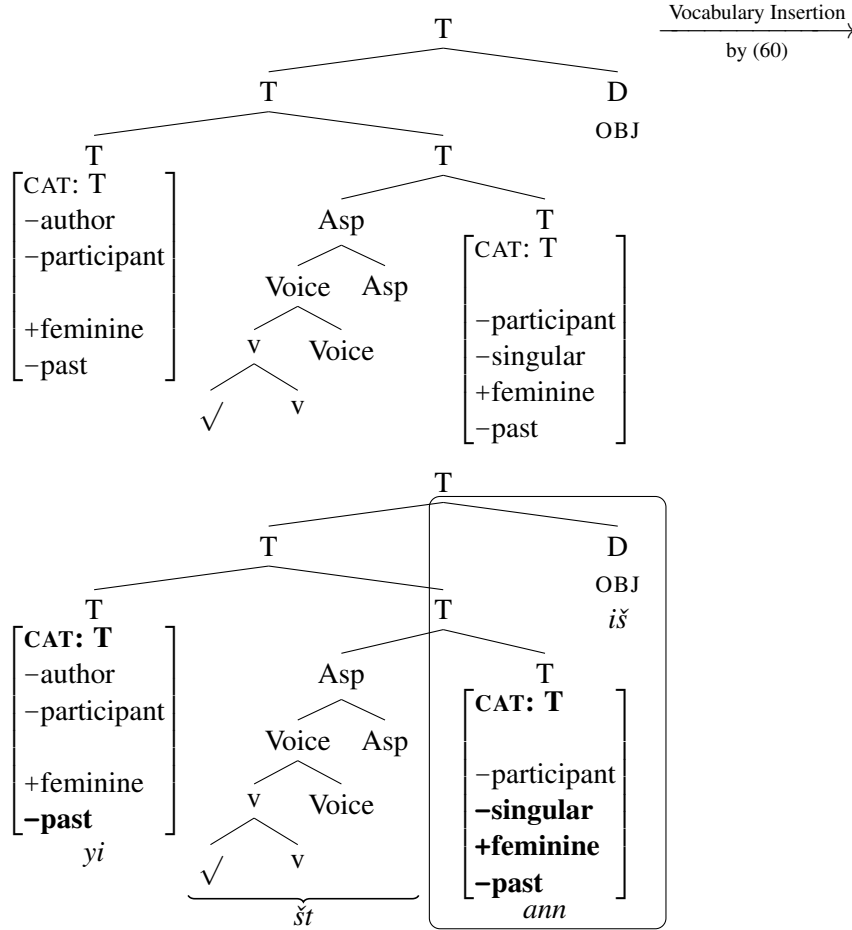
- (63) a. wə- haʕālī -təm b. heʕēlī -tū -nū
and.ASP- brought.up -2.M.PL brought.up -2.M.PL -1.PL.OBJ
‘you will bring up’ (Exod 13.19) ‘you brought us up’ (Num 20.5)

More examples of suffixal allomorphy in discontinuous agreement will be presented in section §4.2 below.

Let us now consider how each approach to Fission fares in explaining variation in the form of discontinuous suffixes, focusing in particular on Ṣanʕānī Arabic. The Fission analysis I proposed in section §3 faces no difficulties in accounting for the pre-clitic allomorph *-ann* in (57b). I will assume in what follows that Semitic pronominal object clitics are D^0 's adjoined to the relevant functional head, in this case T^0 . In the derivation in (64), non-author Fission splits up the features $[-author]$ and $[-singular]$ and copies all non-targeted features into both output nodes. Subsequently, Prefix conjugation Metathesis inverts the order of the leftmost T terminal and the verb stem, deriving the presence of a prefix. Finally, at Vocabulary Insertion, the vocabulary entry in (60a) is selected as the most specific entry which matches the features of the suffixal T, since this T terminal is left-adjacent to an object clitic (D^0). The domain which ultimately determines selection of the appropriate vocabulary entry is boxed.

- (64) Ṣanʕānī Arabic: postsyntactic derivation of *yi-št-ann-iš* ‘they (f.pl.) want you (f.sg.)’ (3-want-F.PL-2.F.SG.OBJ)





By employing autonomous Fission rules, my analysis straightforwardly captures derivational rule feeding and derives the allomorphy of discontinuous suffixes sensitive to their linear position.

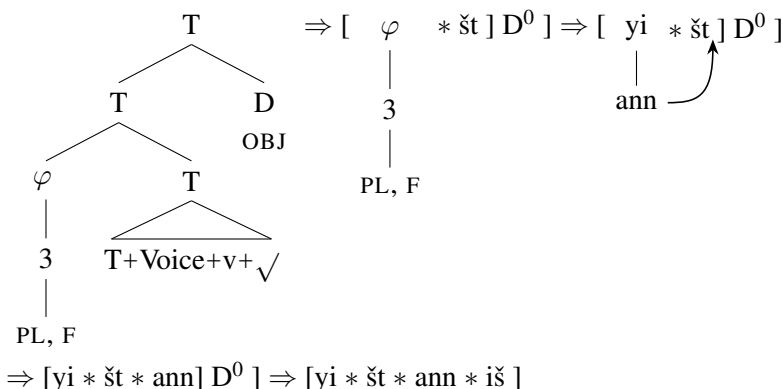
Now let us turn to a Harbourian analysis of the Şanṣānī Arabic feminine plural alternation. If we maintain Harbour's assumption that Fission and Vocabulary Insertion cut up and realize the φ -structure prior to displacement, then we must posit vocabulary entries as in (65)—in particular, the entry in (65b) whose contextual restriction makes reference to a pre-displacement structure.

- (65) Şanṣānī Arabic: vocabulary entries for 3.F.PL allomorphy (*background assumption: Fission is iterated Vocabulary Insertion*)

- a. $\begin{bmatrix} \varphi \\ | \\ 3 \end{bmatrix} \leftrightarrow yi$
- b. $[PL, F] \leftrightarrow ann / \text{--- } T] D^0 T]$
- c. $[PL, F] \leftrightarrow ayn$

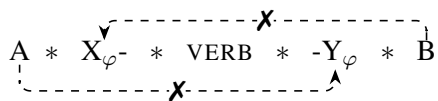
The derivation of a third feminine plural prefix conjugation verb with the *-ann* allomorph before an object clitic will then proceed as follows: when Vocabulary Insertion reaches the φ node, the sub- φ -structure $[\varphi-3]$ is matched with the exponent *yi*- by (65a) and linearized as a prefix, and the sub- φ -structure $[PL, F]$ is matched in-situ with the exponent *-ann* by (65b). The structurally lower *-ann* is then displaced to the right of the verb before the object clitic. Finally, the object clitic is vocabularized and linearized at the right edge of the verb.

- (66) Šanṣānī Arabic: derivation of 3.F.PL non-past/imperfect agreement pre-clitic allomorph (*background assumption: Fission is iterated Vocabulary Insertion*)



In order for Harbour's view of Fission to accommodate the *-ann* allomorph of the feminine plural suffix, that allomorphy must be long-distance. Observe that the vocabulary entry inserting *-ann* in (65b) makes reference to a domain spanning at least one intervening (non-terminal) T^0 projection, crossing the verb stem. This is concerning despite the fact that the φ -features on T and the object clitic D^0 are in the same M-word because true allomorphy of discontinuous agreement affixes is *never* long-distance on the surface in Semitic.²⁸ The form of a discontinuous prefix is never dependent on the presence of material at the right edge of the verb, and the form of a discontinuous suffix is never dependent on the presence of material at the left edge of the verb. Example (67) illustrates these hypothetical configurations.

- (67) Unattested long-distance allomorphy in discontinuous agreement



If vocabulary entries like (65b) could exist, we would have no way of ruling out the unattested allomorphy patterns in (67). In Harbour's system, the prefix and suffix sub- φ -structures are equidistant from the object clitic at the point at which exponents are selected. Thus, Harbour's analysis—and indeed, any analysis which equates Fission with Vocabulary Insertion—overgenerates the predicted set of possible allomorphy configurations.²⁹ If instead Vocabulary Insertion were to be delayed until after the relevant sub- φ -structure was displaced—an option which does not seem possible without admitting teleologically oriented postsyntactic operations (e.g. 'displace a sub- φ -structure only if that structure can eventually be matched by a specific vocabulary entry')—we still would not have escaped the locality issue. In this case, the existence of impure discontinuities would remain a puzzle. Just as D^0 is too far from number and gender features to

²⁸Other restricted theories of allomorphy have likewise noted that, although allomorphy is attested within complex heads, it is rarely (if ever) unbounded. Thus, Bobaljik proposes the following as a necessary but not a sufficient condition on locality for allomorphy.

- (i) "[A] morpheme (or feature) β may condition allomorphy for morpheme α only if the two are in the same morphological 'word' (i.e. complex X^0)."
 (Bobaljik 2012: 12–13)
 a. $\alpha \dots]_{X^0} \dots \beta$
 b. $*\alpha \dots]_{XP} \dots \beta$

Nevertheless, Bobaljik recognizes that there are certain configurations even within complex heads which block allomorphy of α conditioned by β , as I assume in the main text.

²⁹Harbour (2008c) recognizes that suffixal allomorphy constrained by linear position is attested in discontinuous agreement in Yimas, a non-Austronesian language of New Guinea, but he provides no account of the alternation. The first and second person ergative paucal suffix is *-ŋkt* when word-final, and *-ŋkan* otherwise (data from Foley 1991: 216, 217, 221).

condition allomorphy on them in (66), so too would number and gender features in impure discontinuities be too far from person features after displacement.

Thus, any theory which relegates the effects of Fission and Vocabulary Insertion to one and the same operation should be deemed explanatorily inadequate, since such theories fail to predict the generalizations in (56) and (67). By contrast, the modular view of postsyntax adopted here easily accommodates the linear adjacency constraint on allomorphy in discontinuous agreement: Vocabulary Insertion operates in view of the surface linear order of morphemes only after Fission and Metathesis have determined the set of terminals of exponence and their arrangement, respectively.

At this point, a defender of Harbour’s account might question whether the tree structure in (66) is the right one. What if instead the T node bearing φ -features were to be generated to the right of the verb, hence, to the left of D⁰? Number and gender features would then be sufficiently local to the conditioning object clitic, and person features would be displaced to the left of the verb stem after Fission and Vocabulary Insertion. I will set aside this objection for the following reasons. First, privileging the suffixal position in agreement would lose the central insights of Harbour’s account—explaining the “person left, number right” generalization and predicting the fact that non-discontinuous agreement is a prefix in the prefix conjugation, and not a suffix. Second, even if we were willing to cede these empirical gains, the ‘Fission as Vocabulary Insertion’ approach would still overgenerate, as there are apparently no cases of long-distance prefixal allomorphy conditioned by material following the verb (see (67)). Consequently, there does not appear to be a workable fix for Harbour’s account of discontinuous agreement. In the next section, I provide additional evidence for the autonomy of Fission from discontinuous agreement suffixes which combine impure discontinuities with linearly-adjacent allomorphy.

4.2 Impure discontinuities co-occur with suffixal allomorphy

As detailed in the preceding sections, the form of discontinuous agreement suffixes may be conditioned by at least two factors: (i) features also expounded at the prefixal position, and (ii) features of right-adjacent (i.e. linearly subsequent) material. Crucially, and problematically for the classical view of Fission, these two patterns can coexist, producing suffixes as in (68) which are ostensibly doubly conditioned: a suffix Y realizes some feature $[\alpha F_1]$ which is also realized by a prefix X, and the form of Y is determined in part by the presence of a right-adjacent element B.

(68) Impure discontinuities cooccur with suffixal allomorphy

$$X_{[\alpha F_1]} * \text{VERB} * \overset{\text{-----}}{\underset{\downarrow}{Y}}_{[\alpha F_1, \beta F_2]} * B$$

Consider in this regard Mehreyyet, the variety of Mehri (Semitic, Modern South Arabian) spoken in Oman (Watson 2012; Rubin 2018). Second feminine singular prefix conjugation agreement exhibits the standard impure discontinuity, marked by the presence of a prefixal *t*- and suffixal *-t*, both of which index second person features. Somewhat unexpectedly, the suffix disappears when immediately followed by an object clitic.³⁰ Compare the baseline example in (69) with the examples containing object clitics in (70).

- | | | |
|-----|---|--|
| (i) | <p>a. pu- <u>kay</u>- cay -c <u>-nkt</u></p> <p>3.PL.ABS- 1.PL.ERG- see -PERF -PC</p> <p>‘We few saw them’</p> <p>b. ta- <u>kay</u>- cay -c <u>-nkan</u> -um</p> <p>NEG- 1.PL.ERG- see -PERF -PC -3.PL.ABS</p> <p>‘We few didn’t see them’</p> | <p>c. pia- <u>kay</u>- i -c <u>-nkan</u> -mpun</p> <p>talk- 1.PL.ERG- tell -PERF -PC -3.PL.DAT</p> <p>‘We few told them’</p> |
|-----|---|--|

These data present the same issue as the Semitic data discussed in the main text.

³⁰I have nothing to say about why the stem-internal palatal approximant *y* disappears in the presence of a pronominal object. Although Rubin (2018) claims that this monophthongization is due to regular phonological operations in the language, the only

- (69) t- ḥaym -ī
 2- want -2.F.SG
 ‘you (f.sg.) want’
- (70) a. t- ḥam -∅ -an
 2- want -2.F.SG -1.PL.OBJ
 ‘you (f.sg.) want us’
- b. t- ḥam -∅ -ī
 2- want -2.F.SG -1.SG.OBJ
 ‘you (f.sg.) want me’
- c. t- ḥam -∅ -s
 2- want -2.F.SG -3.F.SG.OBJ
 ‘you (f.sg.) want it (f.sg.)’ (Watson 2012: 202)

The loss of this suffix should not be attributed to vowel hiatus resolution, since example (70c) shows that its disappearance can take place before consonant-initial object clitics. It is also unlikely that the disappearance of the suffix in this example is due to resyllabification of the verb after cliticization of the object since the suffix in the expected form **ṭha.mīs* ‘you (f.sg.) want it (f.sg.)’ would otherwise be predicted to bear word-level stress according to the stress algorithm of the language (Watson 2012: 34): word-final CVVC and CVCC syllables are privileged to bear stress. Moreover, similar phonological sequences exist in the language which do not trigger deletion of *ī*, as in *ḏa-xamīs* ‘Thursday’ (not **ḏa-xams*) (Watson 2012: 155).

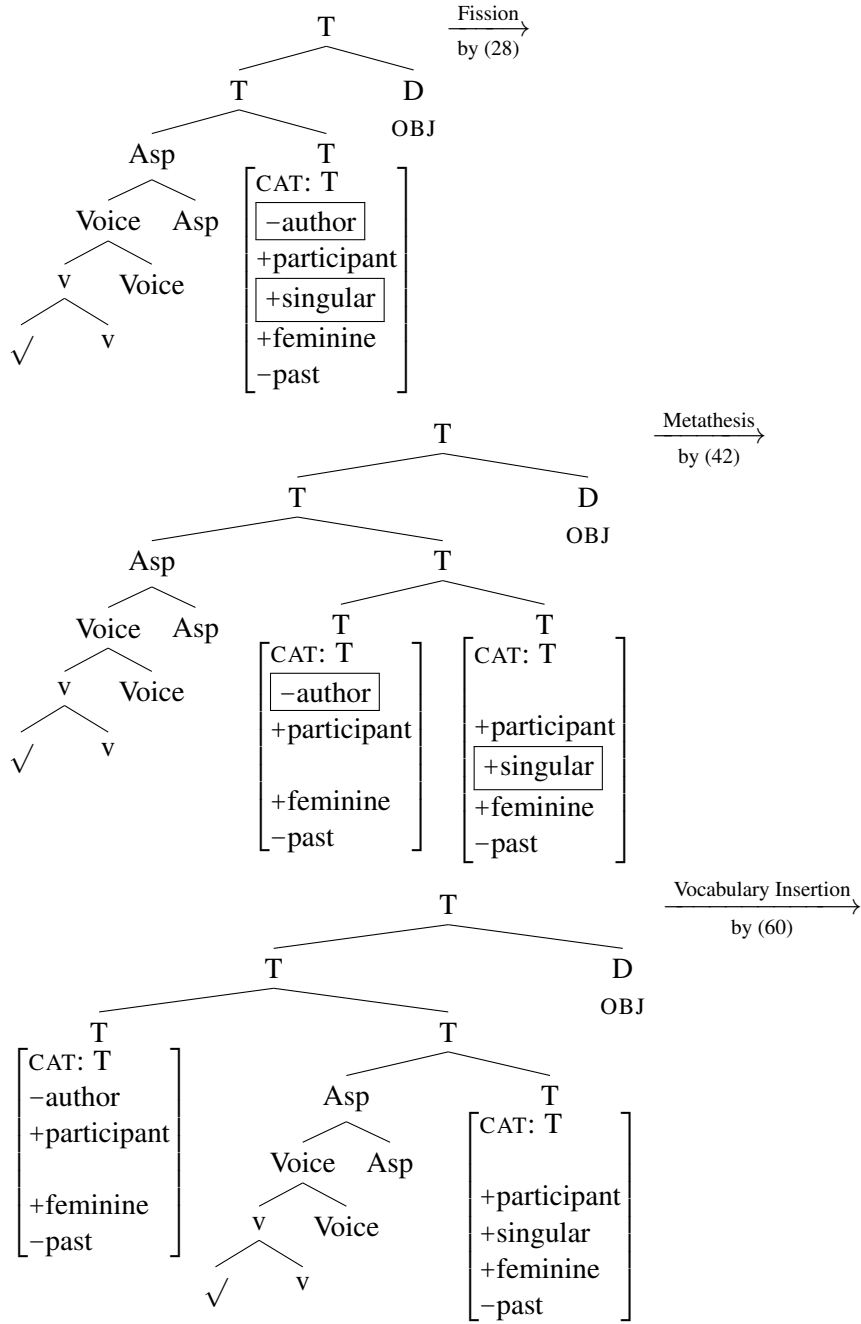
The present analysis offers an explanation for these data: impure discontinuities such as the multiple exponence of second person features in (69) arise because of the feature preservation property of Fission: [+participant] is copied into both nodes and subsequently matched in both at Vocabulary Insertion. The *-ī~-∅* alternation constitutes another case of adjacency-based allomorphy determined after Fission and displacement; the rule in (71b) competing to match the features of the suffix makes reference to a right-adjacent object clitic. I provide the relevant pieces for the derivation of (70c) below.

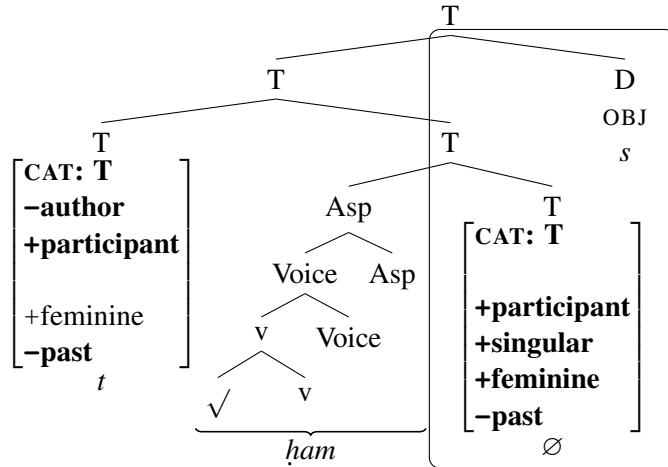
- (71) Mehreyyet: vocabulary entries for 2.F.SG prefix conjugation agreement (*background assumption: Fission is distinct operation*)

- a. $\left[\begin{array}{l} \text{CAT: T} \\ -\text{author} \\ +\text{participant} \\ -\text{past} \end{array} \right] \leftrightarrow t \text{ (2)}$
- b. $\left[\begin{array}{l} \text{CAT: T} \\ +\text{participant} \\ +\text{singular} \\ +\text{feminine} \\ -\text{past} \end{array} \right] \leftrightarrow \emptyset / \text{ ___ } D^0 \text{ (2.F.SG)}$
- c. $\left[\begin{array}{l} \text{CAT: T} \\ +\text{participant} \\ +\text{singular} \\ +\text{feminine} \\ -\text{past} \end{array} \right] \leftrightarrow \bar{i} \text{ (2.F.SG)}$

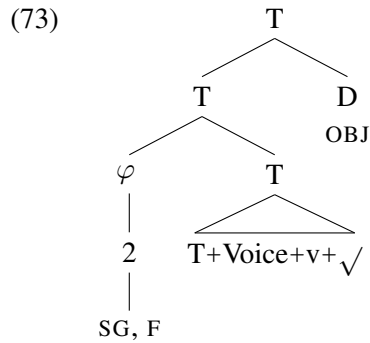
cases he cites of the diphthong *ay* being reduced are in superheavy syllables of the shape *CayCC*. Yet in examples (70a) and (70b), we find the reduced stem variant *ḥam* in an open syllable preceding a vowel-initial object clitic.

- (72) Mehreyyet: postsyntactic derivation of *t-ḥam-Ø-s* ‘you (f.sg.) want it (f.sg.)’ (2-want-2.F.SG-3.F.SG.OBJ)





On the other hand, analyses like Harbour's which treat Fission as iterated Vocabulary Insertion fail to account for these data without simultaneously admitting otherwise unattested long-distance allomorphy. Multiple exponence of second person features demands that the vocabulary entries for both suffixal allomorphs $-\bar{t}$ and $-\emptyset$ reference dominating second person features, while the rule yielding the more specific null allomorph must concomitantly reference the presence of object clitic D^0 . Assuming the complex head in (73), this gives rise to a locality paradox: at least one of the triggers for suffixal allomorphy will always be at a distance from the suffix.



- (74) Mehreyyet: vocabulary entries for 2.F.SG prefix conjugation agreement (*background assumption: Fission is iterated Vocabulary Insertion*)

- a. $\begin{bmatrix} \varphi \\ | \\ 2 \end{bmatrix} \leftrightarrow t$
- b. $[SG, F] \leftrightarrow \emptyset / \begin{bmatrix} \varphi \\ | \\ 2 \\ | \end{bmatrix} T] D^0 T]$
- c. $[SG, F] \leftrightarrow \bar{t}$

The vocabulary entry in (74b), though necessary to derive the $-\emptyset$ allomorph in Harbour's system, is too unconstrained; without additional assumptions, there is no principled way to rule out prefixal allomorphy sensitive to object clitics following the verb.

Similar issues arise in accounting for variation in the form of the third plural prefix conjugation suffix in the variety of Argobba (a Semitic language of Ethiopia closely related to Amharic) spoken in the villages of Shonke and T'ollaha (henceforth simply referred to as Argobba; see Demeke (2015) on variation among Argobba varieties). As background on the language, imperfective verbs contain an encliticized auxiliary, here realized as *-ll*, in addition to the main verb (Wetter 2010: 205). These verbs are typically referred to as “complex imperfectives” in the literature on Ethiopian Semitic languages (see Leslau 1958, 1995, 1997, 1999; Bulakh 2014). Both the main verb and auxiliary exhibit full agreement with the subject: agreement is discontinuous on the main verb and entirely suffixal on the auxiliary. Suffixes attached to imperfective main verbs linearly intervene between the main verb stem and the auxiliary. Example (75) shows that the second and third person plural suffix on imperfective main verbs normally appears as *-u*.

- (75) a. *t-* awid *-u* *-ll* *-uxum* (>*tawdulluxum*)
 2- tell.IPFV -2.PL -AUX -2.PL
 ‘you (pl.) tell’
 b. *y-* awid *-u* *-ll* *-ey* (>*yawdulley*)
 3- tell.IPFV -3.PL -AUX -3.PL
 ‘they tell’

(Wetter 2010: 171)

Interestingly, in the third person only, the plural suffix *-u* disappears before object clitics which come after the main verb but before the auxiliary. No alternation is evident with second plural agreement. Compare (75) with (76).

- (76) a. *t-* awid *-u* *-yyem* *-ll* *-uxum* (>*tawiduyyemlluxum*)
 2- tell.IPFV -2.PL -3.PL.OBJ -AUX -2.PL
 ‘you tell them’
 b. *y-* awid *-∅* *-yyem* *-ll* *-ey* (>*yawidiyyemilley*)
 3- tell.IPFV -3.PL -3.PL.OBJ -AUX -3.PL
 ‘they tell them’

(Wetter 2010: 392, 394)

Crucially, the *-∅* allomorph only occurs before object clitics. The third plural suffix is realized as *-u* before other overt phonological material, such as the negative suffix *-m* (which is itself part of a circumfix *a-...-m*).

- (77) a- *y-* awid *-u* *-m* (>*ayawidum*)
 NEG- 3- tell.IPFV -3.PL -NEG
 ‘they don’t tell’

(Wetter 2010: 407)

Admittedly, the verbs in (76a) and (76b) are syllabified differently due to the shape of suffixal auxiliary agreement: *-lluxum* in the former, and *-lley* in the latter. One might hypothesize then that *-u* is initially inserted in (76b), but is subsequently deleted to comply with the language’s foot structure requirements. The existence of near-minimal pairs without the complicating auxiliaries which nonetheless maintain the *-u~∅* allomorphy in the third person militate against a prosodic solution.³¹ Imperative and jussive verbs in Argobba are formed on a stem composed of the verbal root plus a special “jussive” template consisting of a vocalic melody and a CV-skeleton to arrange the root consonants with the vocalic melody.³² These verb forms lack the enclitic auxiliary of complex imperfectives, and the imperative additionally lacks agreement prefixes (see Kramer 2019). In the imperative, a glottal stop is epenthesized to vowel-initial stems to comply

³¹It is likewise puzzling under a prosodic account of the *-u~∅* alternation why an epenthetic *-i* vowel would subsequently be inserted between the verb stem and object clitic in (76b), thereby rendering the constraint driving *u*-syncope highly opaque.

³²Jussives and imperatives have a non-overlapping distribution according to person features: jussives are used with first and third person subjects and imperatives are used with second person subjects.

with the language’s preference for C-initial syllables (Wetter 2010: 42). Crucially, *-u* still disappears only in the third person.

- (78) a. awid **-u** -yyem (>ʔawiduyyem)
 tell.IMV -2.PL -3.PL.OBJ
 ‘tell (pl) them!’
 b. y- awid -∅ -yyem (>yawidiyyem)
 3- tell.JUSS -3.PL -3.PL.OBJ
 ‘they shall tell them’

(Wetter 2010: 394)

I conclude that there is no secure phonological or prosodic motivation for deleting the plural *-u* suffix just in the third person.

An equally plausible—though ultimately untenable—explanation of the disappearance of third person plural *-u* is that the fissioned suffix node is postsyntactically *Obliterated*. Obliteration is defined in Arregi and Nevins (2012: 9) as a radical kind of Impoverishment which deletes the entire terminal node and inhibits subsequent Vocabulary Insertion at that node, rather than merely deleting a particular set of features on the terminal (see also Arregi and Nevins 2007). As Arregi and Nevins point out, the presence of Obliteration rules can be diagnosed by the presence or absence of allomorphy which is sensitive to the affected node. Fortunately, just such a diagnostic is available for the Argobba plural suffix: the form of the object clitic is conditioned by features of the preceding subject-marking agreement suffix.

Direct object clitics in Argobba have three allomorphs in the third person and two allomorphs in the first and second persons. I will diverge from the descriptive literature which refers to these allomorphs as “Light” and “Heavy” variants (recalling the traditional classification of object clitics in the related Gurage (Semitic) languages of Ethiopia, see Hetzron 1977; Rose 1996, 2007; Banksira 2000) and instead call the three allomorphs “A”, “B”, and “C” to avoid confusion with “light” and “heavy” terminology in the phonological literature. The allomorphs are listed in (79).

(79) A, B, and C object clitic allomorphs of the Argobba of Shonke and T’ollaha

	A	B	C
1SG	-ɲ(ɲ)	-ɲ(ɲ)	-ɲ(ɲ)
2MSG	-ɛx	-ɛx	-kk
2FSG	-ɛš	-ɛš	-čč
3MSG	-ɛy	-ɛbb	-yy/-i
3FSG	-ɛya	-ɛbba	-yya
1PL	-ɛna	-ɛna	-nna
2PL	-ɛxum	-ɛxum	-kkum
3PL	-ɛyem	-ɛbbem	-yyem

(Wetter 2010)

Analyzing the precise distribution of these allomorphs is beyond the scope of this paper. However, one intriguing generalization relevant to the issue at hand is that the C allomorph is always selected when following a verb bearing subject agreement features in the set {2.F.SG, 2.PL, 3.PL}. The examples in (80) illustrate with the third person plural C allomorph *-yyem*.

(80) C clitics always occur after verbs bearing 2.F.SG, 2.PL, or 3.PL agreement

- a. 2.F.SG subject agreement
 t- awid -i **-yyem** -ll -š (>tawidiyyemilliš)
 2- tell.IPFV -2.F.SG -3.PL.OBJ -AUX -2.F.SG

- ‘you (f.sg.) tell them’
- b. 2.PL subject agreement
 t- awid -u -**yyem** -ll -uxum (>*tawiduyyemlluxum*)
 2- tell.IPFV -2.PL -3.PL.OBJ -AUX -2.PL
 ‘you (pl.) tell them’
- c. 3.PL subject agreement
 awid -e -**yyem** (>*?awideyyem*)
 tell.PFV -3.PL -3.PL.OBJ
 ‘they told them’

(Wetter 2010: 394)

After verbs bearing agreement for other φ -features, the A and B allomorphs are used. I provide only the B allomorphs of third plural clitics in (81) for space considerations.

(81) B clitics occur after verbs bearing 2.M.SG and 3.M.SG agreement

- a. 2.M.SG subject agreement
 t- awid -**ebbem** -ll -x (>*tawidebbemillix*)
 2- tell.IPFV -3.PL.OBJ -AUX -2.M.SG
 ‘you (m.sg.) tell them’
- b. 3.M.SG subject agreement
 y- awid -**ebbem** -ell -Ø (>*yawidebbemell*)
 3- tell.IPFV -3.PL.OBJ -AUX -3.M.SG
 ‘he tells them’

(Wetter 2010: 394)

We can now formulate two sets of predictions for analyzing the $-u \sim -\emptyset$ alternation from before. If the disappearance of plural $-u$ were due to Obliteration, we predict either the A or B allomorph to be used with third person plural prefix conjugation verbs. However, if $-\emptyset$ is the allomorphic realization of a featurally contentful agreement suffix, we predict the C allomorph to be used. As the examples from (76b) and (78b) illustrate, the latter prediction is borne out: the C allomorph of third plural object clitics $-yyem$ is used despite the lack of an overt subject agreement suffix. (76b) strikingly contrasts with the phonologically similar third masculine singular verb in (81b) where the B allomorph is selected. Variation in the third plural suffix cannot be attributed to Obliteration.

There is, therefore, substantial evidence in favor of analyzing the $-u \sim -\emptyset$ alternation as one of contextual allomorphy: $-\emptyset$ occurs in the third person before object clitics, and $-u$ occurs elsewhere. Just as with the Mehreyet second feminine singular suffix alternation, the Argobba data are captured if Fission involves feature copying, licensing multiple exponence of third person features, and if Metathesis arranges the terminals prior to Vocabulary Insertion. The fissioned suffix alone will then be sufficiently local to determine the A, B, or C form of the object clitic, and the object clitic will trigger the null plural subject allomorph.

As a final note, Will Oxford (*pers. comm.*) informs me that remarkably similar patterns can be found in Algonquian. Consider the Passamaquoddy-Maliseet verbal template in (82) (terminology from Goddard 1969; orthographic <o> has been replaced with <ə>).

(82) Passamaquoddy-Maliseet verbal template (data from Francis and Leavitt 2008)

Prefix	Stem	Theme sign	Central ending		Peripheral ending
			n-endings	w-endings	
<u>n</u> - ‘1’		-əṁ ‘3INAN object’	-əṇ ‘SG’	- <u>∅</u> ‘SG’	-əḷ ‘3INAN.PL’
<u>k</u> - ‘2’		-a ‘direct’ (3AN object)	-əṇennu ‘1PL’	- <u>nnu</u> ‘1PL’	-əḵ ‘3AN.PL’
			-əṇiya ‘2PL’	- <u>wa</u> ‘2PL’	

The prefix and central ending (underlined) jointly index features of the subject: the prefix primarily marks person, while the central ending marks number and, secondarily, person. This is the hallmark of an impure discontinuity. What's more, there are two distinct sets of central endings whose distribution is determined by features of the peripheral ending (bolded) which indexes features of the object. The “n-endings” occur when the peripheral ending is inanimate, while the “w-endings” occur when the peripheral ending is animate. The examples in (83) and (84) are representative of this contrast.

(83) pun- ‘place INAN’, n-endings
(Francis and Leavitt 2008: 665)

- a. npunənəməl
n- pun -əm -ən -**əl**
1- place -INAN -(1)SG -**3IN.PL**
‘I place them (inanimate)’
- b. kpunənəməl
k- pun -əm -ən -**əl**
2- place -INAN -(2)SG -**3IN.PL**
‘you.SG place them’
- c. npunəmənennul
n- pun -əm -ənennu -**əl**
1- place -INAN -1PL -**3IN.PL**
‘we.EXCL place them’
- d. kpunəmənīyal
k- pun -əm -ənīya -**əl**
2- place -INAN -2PL -**3IN.PL**
‘you.PL place them’

(84) təkəm- ‘hit ANIM’, w-endings
(Francis and Leavitt 2008: 668)

- a. ntəkəmak
n- təkəm -a -Ø -**ək**
1- hit -DIR -(1)SG -**3AN.PL**
‘I hit them (animate)’
- b. ktəkəmak
k- təkəm -a -Ø -**ək**
2- hit -DIR -(2)SG -**3AN.PL**
‘you.SG hit them’
- c. ntəkəmannuk
n- təkəm -a -nnu -**ək**
1- hit -DIR -1PL -**3AN.PL**
‘we.EXCL hit them (animate)’
- d. ktəkəwawak
k- təkəm -a -wa -**ək**
2- hit -DIR -2PL -**3AN.PL**
‘you.PL hit them’

Oxford (2019) provides a formal, morphosyntactic analysis of Algonquian verbal morphology: the theme sign is Voice, the prefix and central ending are Infl, split up postsyntactically by Fission, and the peripheral ending is C. It remains to be seen whether the analysis presented here for Semitic can extend directly to the Algonquian data. Still, it is a strength of this analysis that it can countenance the apparently janus-faced nature of the forms of central endings—one face towards the person features of the prefix, and one face towards the features of the peripheral ending. If we adopt a Fission-based analysis, the impure person discontinuity mentioned above may be attributed to the feature copying component of Fission, while the surface-adjacent allomorphy of the central ending arises at Vocabulary Insertion, conditioned by features of the peripheral ending.

In summary, the range of attested variation in Semitic discontinuous agreement—and perhaps in Algonquian verbal paradigms—strongly supports a modular view of the postsyntax. Contrary to previous assumptions, impure discontinuities do not involve contextual allomorphy; indeed, they must not under any constrained theory of allomorphy which invokes some notion of locality. True allomorphy in discontinuous agreement is always defined over the surface string of adjacent elements, paralleling similar findings that linear adjacency is a prerequisite for conditioning allomorphy in other domains (see Embick 2010; Arregi and Nevins 2012; Ostrove 2015; Merchant 2015; Merchant and Pavlou 2017; among others).

5 Conclusion

In this paper, I have laid out a novel empirical discovery: allomorphy in discontinuous agreement is always locally constrained by linear adjacency. This finding forms the basis for my claim that Fission is autonomous and that postsyntax is serially ordered (see Arregi and Nevins 2012). Since the form of discontinuous affixes

must be determined after displacement, displacement—which is parasitic on Fission—must precede Vocabulary Insertion. This generalization is missed by any theory in which Fission and Vocabulary Insertion are coextensive, as there will be no way to state a linear adjacency constraint on fissioned affixes if Vocabulary Insertion operates before the full linear order of morphemes has been determined. While I have restricted my attention here to the specific formalism proposed in Harbour (2008a), this criticism extends to other reductionist analyses of the postsyntax (see, e.g., Trommer 1999). Rather than acting as a postsyntactic clean-up mechanism which discharges remnant features during insertion, I have proposed that Fission acts in response to morphotactic constraints banning the coexponence of marked feature combinations. I have also argued that Fission imposes a partial linear ordering onto its output nodes, a process which is constrained by featural markedness encoded in terms of dominance relations among φ -features in the feature stack. In doing so, I propose to eliminate language-specific ordering rules in favor of a general preference for more marked features to be linearized to the left under Fission. The empirical adequacy of this claim is still uncertain, and it is hoped that future research will shed light on whether or not my proposed dominance-to-precedence mapping rule is tenable.

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