Morphology before phonology:
A case study of Turoyo (Neo-Aramaic)*

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Abstract

Some models of the morphology-phonology interface take (certain aspects of) morphology and phonology to be computed in the same component of the grammar, simultaneously, including many instantiations of Optimality Theory (McCarthy and Prince 1993a,b, Kager 1996, Hyman and Inkelas 1997, Mascaró 2007, Wolf 2008, *i.a.*). On the other hand are models that separate morphology from phonology, including Distributed Morphology (Halle and Marantz 1993, 1994) and related models (e.g., Trommer 2001, Bye and Svenonius 2012, Dawson 2017, Rolle 2020), as well as "subcategorization"-based approaches (Paster 2006, 2009, Yu 2007, *i.a.*). I undertake a careful study of the order of operations needed to derive the form of finite verbs in the Neo-Aramaic language Turoyo (Jastrow 1993). Two morphophonological phenomena found in Turoyo verbs provide evidence for a separation of morphology from phonology: (i) phonologically-conditioned suppletive allomorphy that is anti-optimizing and surface opaque (reaffirming the findings of Paster 2006); and (ii) phonological displacement of an affix (à la infixation) that is also anti-optimizing and surface opaque, and even more surprisingly, counterbleeds morphological operations in the verbal complex but feeds/bleeds phonological ones. The main conclusion from Turoyo is that exponent choice precedes, and is oblivious to, the regular phonology of the language and considerations of phonological optimization. Turoyo also provides a more general window into a number of issues at the morphology-phonology interface, including cyclicity, the timing of infixation, and constraints on allomorphy.

1

1 Introduction

Are morphological exponents (suppletive allomorphs) selected in concert with, or apart from, phonological processes and considerations? The answer to this question has broad implications for modeling the morphology-phonology interface, and there is still considerable theoretical debate in this area. One popular view, that of many instantiations of Optimality Theory (McCarthy and Prince 1993a,b, Mester 1994, Kager 1996, Mascaró 1996, Booij 1998, Hyman and Inkelas 1997, Horwood 2002, Bonet et al. 2007, Mascaró 2007, Wolf 2008, Kim 2010, *i.a.*), holds that a number of interactions between morphology and phonology are best modeled by taking phonological/prosodic considerations to compete directly with morphological ones; phonological well-formedness and morphological well-formedness thus must be evaluated in parallel, at least to some extent. An alternative view is that morphology is fully separate from, and prior to, phonology—phonological and morphological well-formedness are not evaluated in parallel; this is the position of Distributed Morphology (Halle and Marantz 1993, 1994, Embick 2010), some models that blend Distributed Morphology and Optimality Theory (e.g., Trommer 2001, Bye and Svenonius 2012, Dawson 2017, Foley 2017, Rolle 2020, *i.a.*), and "subcategorization"-based approaches (Paster 2006, 2009, Yu 2007, *i.a.*).

In this paper, I undertake a careful study of the order of operations needed to understand the form of finite verbs in the Neo-Aramaic language Turoyo, drawing on data from Jastrow 1993. Two morphophonological phenomena found in Turoyo verbs provide evidence for a separation of morphology from phonology: (i) phonologically-conditioned suppletive allomorphy that is anti-optimizing and surface opaque; and (ii) phonological displacement of an affix (à la infixation) that is also anti-optimizing and surface opaque, and even more surprisingly, it counterbleeds morphological operations in the verbal complex but feeds/bleeds phonological ones. While some of the Turoyo findings simply reaffirm previously-established findings (see especially Paster 2006, 2009, Yu 2007), the core novel argument comes from showing that phonologically-conditioned suppletive allomorphy persists across a linearly-intervening (but not structurally-intervening) affix. Another novel argument comes from the nature of this affix's displacement, which I show is itself opaque and thus must precede the general phonological computation. Finally, Turoyo illustrates the need for domains and cyclicity in modeling exponent choice, and points to certain structural constraints on allomorphy, in particular, that locality is defined by adjacency (Embick 2010) and that phonologically-conditioned allomorphy is inward-looking (Carstairs 1987, Bobaljik 2000).

It is important to note that the argument will *not* be that there is a wholesale, double-blind separation of all morphology from all phonology. Rather, the separation of morphology from phonology occurs within each *cycle*—phonological optimization is late, following (and thus not able to influence) the choice of all exponents within the cycle; morphological choices precede phonological ones, i.e., they are not made together, and morphology always "wins". There are, though, (at least) two principled openings for phonology to influence morphology that stem from the assumption that derivations proceed bottom-up, both within and across cycles: (i) within a cycle, the choice of a particular exponent may be influenced by the underlying phonological form of a more-embedded exponent; and (ii) phonological optimiza-

tion/operations that occur at the end of one cycle could in principle feed exponent choice and other morphological operations in the next cycle.

The paper will unfold as follows. In §2, I provide the crucial background on Turoyo verbal morphology and phonology that later data and arguments will rest on. In §3, I motivate two core cases of suppletive allomorphy in Turoyo verbs, and show that they present a preliminary indication that exponent choice precedes phonological processes and considerations. In §4, I turn to a stronger argument, furnished by some unexpected and illuminating data: in its linear position in the word, a "displaced" infix-like morpheme in Turoyo (the past tense morpheme) is invisible to the allomorphy of §3, but visible to the general phonological processes of §2.2; I show that in order to make sense of this data, the displacement of such an affix must be ordered *after* exponent choice (at least for the morphemes more embedded than the infix), and *before* phonology. §5 shows that it is not possible to construct a functioning account of Turoyo where morphology and phonology are simultaneous, which is demonstrated in an OT framework inspired by Kager 1996 and Mascaró 1996, 2007. Finally, §6 reviews the implications of these findings.[1]

2   Background on Turoyo

Turoyo is an endangered Central Neo-Aramaic language spoken originally in southeastern Turkey, and spoken today mainly in a widespread diaspora community (Weaver and Kiraz 2016). All the data presented here (unless otherwise noted), and some of the basic generalizations, come from Jastrow's (1993) grammar of Turoyo (henceforth abbreviated J93), which focuses on the Midwoyo dialect of Turoyo, from the village of Mīdin in the Tūr ʿAbdin region of Turkey.[2] It is important to note, though, that I analytically diverge from and add to the observations in Jastrow 1993 in many cases.

Like all Neo-Aramaic languages, Turoyo has rich verbal morphology. It will be this morphology—in particular, tense and agreement morphology on finite verbs—that interests us here. This section lays out the background that is needed to build up the arguments in later sections: the basic morphological components of Turoyo verbs, §2.1, and a few general phonological processes in Turoyo, §2.2.

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[1] The reader will notice a number of lengthy footnotes throughout the paper; most of these footnotes serve to address the abundance of seemingly plausible alternative analyses that come up nearly every step of the way.

[2] Throughout the paper, I adopt the practical orthography that Jastrow (1993) uses, with the exception of a few consonants, for which I instead consistently use the corresponding IPA symbol (ʔ, ʕ, θ); dots underneath consonants indicate pharyngealization. I have translated example meanings from German to English (with the help of Sebastian Holt), and I have segmented all examples into their component underlying pieces.

2.1 Verbal morphology

Finite verbs in Turoyo encode aspect[3] distinctions in the verb base (a root-and-template form), while tense distinctions as well as agreement are affixal on the base. The example in (1) below shows a transitive verb (root: *zbṭ* 'catch'), with two arguments indexed on the verb. As pronouns in Turoyo are null except when focused, this verb can stand alone as a well-formed sentence. (Throughout the paper, the morpheme-by-morpheme breakdown in examples gives the forms of the morphemes before any purely phonological processes have taken place; surface forms are given in parentheses next to every example.)

(1) zəbṭ   -o   -ət   -l-e   (=zəbṭatle)
     catch.IMPF -**B**F.SG -**S**2SG -**L**-3M.SG
     'you (fem. sg.) catch him' (J93:135)

As can be seen in (1), agreement is suffixal on the verb stem, and is made up of three distinct φ-encoding pieces—these are labeled with bold italic capital letters in the glosses (B, S, L), and each letter represents a different paradigm/pattern of agreement. The "base" set, B, is always the closest to the verb base, and encodes (maximally) the number and gender of an argument, as shown in the forms in Table 1. The plural B morpheme has two allomorphs, bolded in the table, which will be the topic of §3.2.

Table 1: B agreement in Turoyo (J93:125)

	B form
M.SG	-$\emptyset$
F.SG	-o
PL	**-i/-ən**

The next agreement morpheme in the verbal complex is from the S (for "simple") set of agreement, which encodes (maximally) the person and number of the same argument indexed by B agreement (whatever that argument is), leading to a partial redundancy in feature marking, namely, of number marking. This redundancy can be seen in (1) with B agreement encoding feminine singular and S agreement encoding 2nd person singular—the argument B and S are indexing is 2nd person feminine singular. The full set of S morphemes is given in Table 2.

Finally, furthest out from the verb we see the L set of agreement forms, which consists of a morphologically-separable dative/locative piece, usually *l*, plus a "personal suffix" (found independently on prepositions and as pronominal possessors; see Table 3 in §2.2.2). I will refer to the dative/locative piece as "the L morpheme", whereas I will refer to the L morpheme

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[3]J93 refers to the (finite) verb bases as varying based on tense, but it is clear from the existence of separate tense morphemes (and the effect these morphemes have on the interpretation of the verb) that the primary semantic contribution of the verb base is not temporal but rather aspectual. This accords with findings about the verb base in other Neo-Aramaic languages (see, e.g., Hoberman 1989, Coghill 1999).

plus the personal suffix together as "the L agreement marker," or as "L agreement." The L agreement marker can encode a full set of φ-features (thanks to the personal suffix), and always indexes a *distinct* argument from that indexed by B and S agreement. The L paradigm is also shown in Table 2.

Table 2: S and L agreement in Turoyo (J93:128–129)

	S form	L form
1SG	-no	-l-i
1PL	-na	-l-an
2M.SG	-ət	-l-əx
2F.SG		-l-ax
2PL	-ut(u)	**-l/n**-xu
3M.SG	-∅	-l-e
3F.SG		-l-a
3PL		**-l/n**-Ce[4]

The bolded initial consonants in the cells of the 2PL and 3PL L agreement markers constitute a case of allomorphy that is taken up in §3.1. (Note that I will actually ultimately argue that the two alternating consonants in 2PL and 3PL are *n* and an empty consonant slot, C, not *n* and *l*; see §3.1.3.)

While the basic verbal template seen in (1) is consistent (Verb-B-S-L), which agreement suffixes agree with which arguments changes based on transitivity and aspect (Kalin 2018a,b). There is also another, special verbal configuration with two L agreement markers and no B nor S agreement (Verb-L-L), discussed briefly in §3.1.2.

2.2 Phonology

A number of phonological processes in Turoyo obscure the (full form of) the underlying morphemes in verbs. The ones of most relevance to the purposes of this paper are introduced in §2.2.1-3: hiatus resolution, lowering, shortening, epenthesis, lengthening (which I will argue is actually the filling of empty consonant slots provided by certain morphemes), and regressive sonorant assimilation.

2.2.1 Hiatus resolution, lowering, shortening, and epenthesis

In (1), two phonological processes are at play:

(2)   a.   HIATUS RESOLUTION: When two vowels are adjacent, one is deleted.[5]

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[4]As will be discussed in §2.2.2, the personal suffix for the 3rd person plural is best represented as starting with an empty consonant slot.

[5]Vowel hiatus resolution does not consistently delete the first or second vowel in hiatus, but does consistently delete a particular vowel in a given vowel cluster. It is beyond the scope of this paper to determine

b.   LOWERING: Short /o/ is realized as [a] in closed syllables.

In (1), ə is deleted via HIATUS RESOLUTION and then *o* undergoes LOWERING.

The next relevant phonological process is SHORTENING, (3): long consonants are only tolerated intervocalically, and so when a long consonant is word-final or in a cluster with another consonant, the long consonant is shortened, (4). This is also true of sequences of identical adjacent consonants. (I use bolding throughout the paper to draw attention to the relevant components of examples.)

(3)   SHORTENING: A long consonant (or a set of identical adjacent consonants) is shortened non-intervocalically.

(4)   a.   š**arr**   (=ša**r**)
          fight
          'a fight' (J93:17)
      b.   ʔu-   š**arr** -aθθe   (=ʔuša**rra**θθe)
          DET.M.SG- fight -3PL.POSS
          'their fight' (J93:17)

In (4a), the word-final long consonant undergoes SHORTENING, but in (4b), we see this long consonant survive intact when followed by a vowel-initial possessive suffix.

Next, there is a process of ə-epenthesis that serves to break up some CC and CCC clusters; this takes place when the cluster is such that its segments cannot be parsed into (parts of) well-formed syllables in the cluster's environment, the precise conditions of which will not concern us here.

(5)   EPENTHESIS: [ə] is inserted to break up non-syllabifiable consonant clusters.

For example, when a preposition that consists of a single consonant prefixes to a noun that begins with two consonants, EPENTHESIS takes place, (6).

(6)   l-   bsorino   (=l**ə**bsorino)
      to- Baspirin
      'to Baspirin (a town in southeast Turkey)' (J93:26)

Note that if a sequence of consonants is non-syllabifiable, and SHORTENING would resolve this (e.g., if one of the consonants is long, or if two adjacent consonants in the cluster are identical), then SHORTENING generally takes place instead of EPENTHESIS. Thus, while *šarr* in (4a) poses a problem for syllabification, it cannot be saved by EPENTHESIS (deriving *šarrə* or *šarər*), but rather the final consonant must undergo SHORTENING (to *šar*). Put another way, SHORTENING bleeds, and so must precede, EPENTHESIS.[6]

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exactly what features regulate which vowel is deleted. (For variable resolution of vowel hiatus, see Casali 1996.)

   [6]This can be modeled in Optimality Theory as the faithfulness constraint regulating SHORTENING being ranked below the faithfulness constraint regulating EPENTHESIS; see §5.2.

2.2.2 Lengthening as filling empty consonant slots

An important phonological process that will appear centrally throughout the rest of the paper involves what looks like certain consonants lengthening intervocalically. Intervocalic lengthening is crucially *not* a general phonological process in Turoyo—consonants do not lengthen between vowels in the usual case. Rather, it is certain morphemes that seem to trigger lengthening of a singleton consonant (i.e., a consonant not in a cluster) in the stem, at the edge where the morpheme attaches.

Take, for example, the plural definite determiner: this determiner is prefixal on nouns and lengthens a noun-initial singleton consonant, (7a-b); there is no such lengthening for nouns with initial clusters, (7c), i.e., non-intervocalically. (This is not surprising given what we have already seen about the constraints on syllabification in Turoyo above.) I have pre-theoretically marked the plural definite determiner in (7) with a star (⋆) to indicate that it is special in that it triggers intervocalic lengthening; this representation will be revised below.

(7) a. ʔa⋆-   malk-e   (=ʔa**mm**alke)
         DET.PL- king-PL
         'the kings' (J93:37)
     b. ʔa⋆-   ʕez-e   (=ʔa**ʕʕ**eze)
         DET.PL- goat-PL
         'the goats' (J93:37)
     c. ʔa⋆-   ḥwoθ-e   (=ʔaḥwoθe)
         DET.PL- sister-PL
         'the sisters' (J93:37)

Another such case is found with the 3rd person plural personal suffix (familiar from the L agreement marker, Table 2). Table 3 gives the surface forms of two inflecting prepositions, which show clearly that what characterizes the 3rd person inflected forms (bolded) is a lengthening of the final consonant of the preposition. (LOWERING, (2b), is also seen in certain suffixed forms of *xtoθ*, along with vowel reduction in the same environments for *min*.)

Table 3: Inflected prepositions (J93:258, 262)

	min 'with X'	*xtoθ* 'as X'
1SG	min-i	xtoθ-i
1PL	min-an	xtoθ-an
2M.SG	min-əx	xtoθ-əx
2F.SG	min-ax	xtoθ-ax
2PL	mən-xu	xtaθ-xu
3M.SG	min-e	xtoθ-e
3F.SG	min-a	xtoθ-a
3PL	**mən-ne**	**xtaθ-θe**

There are two basic possibilities for understanding this lengthening phenomenon. One is to posit a morphophonological rule that lengthens stem-edge singleton consonants that are combined with specific triggering morphemes. However, there is a better alternative: those morphemes that trigger intervocalic lengthening are just those that have an empty consonant slot (C) at the edge that they share with the stem. Empty consonant slots are filled by the spreading of adjacent melodic features, which can be stated as a purely phonological process:

(8)   C-FILLING: An empty consonant slot shares the melodic features of an adjacent consonant.

Assuming C-FILLING, the underlying form of the plural definite determiner from (7) is ʔaC-, and the 3rd person personal suffix (from Table 3) is -Ce. The appearance of lengthening in (7a-b) and the final row of Table 3 comes from C-FILLING.

The apparent absence of lengthening in (7c), and in general outside of intervocalic contexts, is predicted by a constraint we have already seen on the phonology of Turoyo in §2.2.1: long consonants are only tolerated intervocalically. We can thus hypothesize that in (7c), the features of ḥ do indeed spread to the C slot of the determiner, but this lengthened consonant subsequently undergoes SHORTENING; nothing special needs to be said, except that C-FILLING must precede both EPENTHESIS and SHORTENING.[7]

I take the empty consonant slot analysis of consonant lengthening to be the better representation of this process in Turoyo for several reasons. The first is that using empty consonant slots in morpheme representations allows us to posit a purely phonological process, C-FILLING, to account for consonant lengthening, rather than a morphophonological rule that applies across a group of morphemes that do not form a natural class. While the C analysis does involve a certain abstraction over phonological segments, the existence of empty consonant slots as a phonological primitive is well-established in phonological theory, beginning with McCarthy (1979, 1981), who builds on the autosegmental theory of Goldsmith (1976). Empty C slots are used widely for a range of phenomena (Marantz 1982, Clements and Keyser 1983, Mester 1986, Maddieson and Ladefoged 1993, Tranel 1995, Ham 2001, *i.a.*), including for the sort of lengthening seen here (Kenstowicz 1986, Jean-François 1986, Hualde 1992, *i.a.*). Note, too, that Turoyo is a root-and-template language, for which empty consonant slots have been used extensively, starting with McCarthy 1979, 1981.

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[7]A reviewer points out that it is impossible to confirm that this lengthening-then-shortening takes place (which has a Duke of York (Pullum 1976) flavor), as compared to simply the blocking/absence of lengthening in the first place. The reviewer further notes that, while there is independent evidence within Turoyo for the possibility of underlying VC_iC_iCV sequences (which are ultimately repaired by shortening), there is no such independent evidence for underlying VCC_iC_iV sequences. The possibility of this latter configuration is crucial for my later analysis: I argue that there is an intermediate level of representation where long consonants are indeed tolerated in clusters post-consonantally, as will be seen, for example, in (16a), whose derivation is given in (18), and in the representation in (28). In this paper, I will take the evidence from the past tense forms seen in §4.2 (in particular, (51a), (53b), and (56b)) to be strong enough to at least entertain the possibility of derived VCC_iC_iV sequences, and leave it for future research to determine whether there is independent evidence in Turoyo for this configuration.

The second reason to prefer an analysis using empty consonant slots is that it provides a basis for straightforward modeling of several phenomena in Turoyo (taken up in the remainder of this paper), which would remain mysterious under a morphophonological rule analysis. As we will see throughout §3, empty consonant slots are crucial in Turoyo for being able to state consistent natural-class environments for phonologically-conditioned allomorphy. In addition, there is one particular case of non-local assimilation in Turoyo that is completely inexplicable under a morphophonological rule analysis, but falls out neatly from an empty consonant slot analysis; this case is discussed at the end of §3.1.3, in the text surrounding (32).

2.2.3   Regressive sonorant assimilation

The final relevant piece of Turoyo's general phonology is a uniformly regressive assimilation process involving coronal sonorants (*r, l, n*), (9)–(10). This assimilation is probabilistic, taking place around 75% of the time in natural speech (J93:19).

(9)   REGRESSIVE SONORANT ASSIMILATION: A coronal sonorant assimilates fully to an immediately following coronal sonorant. (Optional)

(10)   a.   mə**r**   -**l**-an   (=mə**rl**an∼mə**ll**an)
             say.PFV -***L***-1PL
             'we said' (J93:19)
        b.   ʕa**l**- **r**iš-e   (=ʕa**lr**iše∼ʕa**rr**iše)
             on   head-3M.SG
             'on his head' (J93:19)
        c.   nafə**l**   -∅   -**n**o   (=nafə**ln**o∼nafə**nn**o)
             fall.PFV -***B***M.SG -***S***1SG
             'I (masc.) fell.' (J93:19)

Note that there is no progressive assimilation in Turoyo; REGRESSIVE SONORANT ASSIMILATION does not have a progressive counterpart, restricted to sonorants or otherwise.

2.3   Interim summary

The Turoyo verb follows the basic template in (11), with each of B, S, and L referring to a different agreement paradigm, given in Tables 1–2 above.

(11)   Verb-B-S-L

Allomorphy in the L agreement paradigm, §3.1, and allomorphy in the B agreement paradigm, §3.2, will furnish the first arguments for a separation of morphology from phonology, with morphology preceding phonology. The strongest argument will be presented in §4, where we will examine the past tense morpheme and its interaction with §3's allomorphy and §2.2's phonological processes. The complete set of relevant phonological processes is compiled below for ease of reference.

(12)   Relevant phonological processes in Turoyo

    a.   HIATUS RESOLUTION: When two vowels are adjacent, one is deleted.

    b.   LOWERING: Short /o/ is realized as [a] in closed syllables.

    c.   SHORTENING: A long consonant (or a set of identical adjacent consonants) is shortened non-intervocalically.

    d.   EPENTHESIS: [ə] is inserted to break up non-syllabifiable consonant clusters.

    e.   C-FILLING: An empty consonant slot shares the melodic features of an adjacent consonant.

    f.   REGRESSIVE SONORANT ASSIMILATION: A coronal sonorant assimilates fully to an immediately following coronal sonorant.
       (Optional)

3 Morphology before phonology: Arguments from allomorphy

In this section, we will take a close look at allomorphy in the verbal complex. Allomorphy of the L morpheme (the DAT piece of the L agreement marker, usually *l*), §3.1, and of the plural B morpheme, §3.2, shows us that allomorph choice (i) may be surface opaque, (ii) feeds phonological operations, and (iii) may be neutral with respect to phonological optimization or even anti-optimizing. (I use serial derivations for illustration throughout this section; to see this data modeled in OT, see §5.2.)

Both cases of allomorphy discussed in this section involve what looks to be outwardly-sensitive phonological conditioning, which runs counter to the otherwise robust crosslinguistic generalization that phonologically-conditioned allomorphy is always inward-looking (Carstairs 1990, Bobaljik 2000, Paster 2006). To address this, §3.3 briefly investigates the structure of the Turoyo verb-word, and argues (following Kalin 2018a,b) that Turoyo does not in fact contradict this crosslinguistic generalization.

3.1 L allomorphy

As discussed in §2.1, each member of the L set of agreement markers consists of an L morpheme (a locative/dative piece) plus a "personal suffix" (showing φ distinctions; see Tables 2 and 3). The L morpheme, however, is not always realized as *l*: it is sometimes realized as an *n*, §3.1.1–§3.1.2, and sometimes as an empty consonant slot, §3.1.3. §3.1.4 puts all of the observations together, as previewed in (13).

(13)   L → *n* / PL__C   (= *n* when following PL and preceding a cons)
          C / __C   (= empty C slot when preceding a consonant)
          l /   (= *l* elsewhere)

As seen throughout this section and as will be highlighted in §3.1.5, the choice of allomorph may be surface opaque (and so must derivationally precede the phonological processes in

(12)) and is not phonologically-motivated. This is suggestive that morphology precedes phonology, though the stronger more definitive argument will come from the data in §4.

3.1.1   Introducing the *l/n* alternation

The L agreement markers typically begin with the consonant *l* (hence the label "L" for this agreement set); this can be seen above in Table 2 and also in (1), repeated below, bolding added.

(14)   zəbṭ   -o   -ət   -**l**-e   (=zəbṭat**l**e)
        catch.IMPF -***B***F.SG -***S***2SG -***L***-3M.SG
        'you (fem. sg.) catch him' (J93:135)

Unlike the other L agreement markers, however, the L morpheme in the 2nd person plural L agreement marker (abbreviated L2PL) and 3rd person plural L agreement marker (abbreviated L3PL) behaves exceptionally in sometimes being realized as *n*. In particular, the L morpheme in L2PL and L3PL is realized as *n* when the immediately preceding morpheme bears a plural feature. This is schematized informally in (15); these representations will be revised.

(15)   a.   L-3PL → *-n-ne* / PL___
                     → *-l-le* (elsewhere)

        b.   L-2PL → *-n-xu* / PL___
                     → *-l-xu* (elsewhere)

Note that the alternation in (15a) looks as though it takes place in both the L morpheme and the personal suffix, as the *n* appears in both pieces of the L agreement marker (the L morpheme and the personal suffix). However, recall from §2.2.2 that the 3PL personal suffix is underlyingly *-Ce* (see Table 3), and so the alternation is really just an alternation in the form of the first consonant, the L morpheme, in both (15a) and (15b).[8] I will refer to allomorphy of the L morpheme as "L allomorphy."

The examples in (16)–(17) show L3PL and L2PL in a plural environment, where the *n*-form appears. I illustrate here with the plural environment being a 1PL S morpheme, (16), and 2PL S morpheme, (17). (3PL S morphemes come with an additional complication which is taken up in §3.2, but the generalization still holds.)

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[8]One might wonder at this point about deriving L allomorphy through Agree, with some kind of portmanteau agreement—e.g., *n* expones an L morpheme that has Agreed with a plural non-1st person argument *and* a distinct plural argument. However, since which arguments are tracked by which piece of agreement changes by aspect and transitivity (see §3.3), it would be quite complex (and stipulative) to make sure that the L morpheme Agrees with exactly the right arguments such that *n* would appear just in case the linearly preceding agreement morpheme is plural and the linearly following agreement morpheme is 2nd or 3rd person plural. Further, there is no independent reason to think that the L morpheme is an agreeing element, in the sense of itself collecting φ-features.

(16)   L3PL and L2PL in the environment of S1PL

    a.   zəbṭ   -i   -na   **-n**-Ce   (=zəbṭina**nn**e)
         catch.IMPF -***B***PL -***S***1PL -***L***-3PL
         'we catch them' (J93:136)

    b.   zəbṭ   -i   -na   **-n**-xu   (=zəbṭina**n**xu)
         catch.IMPF -***B***PL -***S***1PL -***L***-2PL
         'we catch you (pl)' (J93:136)

(17)   L3PL and L2PL in the environment of S2PL

    a.   zəbṭ   -i   -ut   **-n**-Ce   (=zəbṭut**n**e)
         catch.IMPF -***B***PL -***S***2PL -***L***-3PL
         'you (pl) catch them' (J93:135)

    b.   zəbṭ   -i   -ut   **-n**-xu   (=zəbṭutə**n**xu)
         catch.IMPF -***B***PL -***S***2PL -***L***-2PL
         'you (pl) catch yourselves' (J93:135)

Following a plural morpheme, L3PL and L2PL begin with *n*, rather than *l*.

    In addition to the *n* allomorph appearing in (16)–(17), a number of phonological processes are at play in these examples. In (16), the only phonological process we see is in (16a), where there is C-FILLING. In (17a–b), there is HIATUS RESOLUTION across the B and S agreement morphemes. Further out from the root in (17a), we see C-FILLING, which feeds SHORTENING. The (phonological) derivation of the surface form in (17a) is laid out in (18). (I leave out REGRESSIVE SONORANT ASSIMILATION from these derivations as J93 in general gives surface forms in which this probabilistic process has *not* applied.)

(18)   Input (17a):   zəbṭiutnCe
           HIATUS RESOLUTION: zəbṭutnCe
           C-FILLING: zəbṭutnne
           SHORTENING: zəbṭutne
           EPENTHESIS: – – – –
           Output: zəbṭutne

In (17b), unlike in (17a), the consonant cluster cannot be resolved by SHORTENING, since none of the adjacent Cs are identical, and so instead this illicit cluster is broken up by EPENTHESIS, as laid out in (19).

(19)   Input (17b):   zəbṭiutnxu
           HIATUS RESOLUTION: zəbṭutnxu
           C-FILLING: – – – –
           SHORTENING: – – – –
           EPENTHESIS: zəbṭutənxu
           Output: zəbṭutənxu

This data will be revisited in §3.1.5 and then again in §5.2, with a discussion of its opacity and its implications for modeling L allomorphy; in short, this data will demonstrate that the choice among L's allomorphs cannot be made by phonological considerations.

To provide a comparison for L3PL and L2PL, (20) shows that all other L agreement markers stay *l*-initial in plural environments, i.e., the L morpheme does not alternate in these other L agreement markers.

(20)　a.　nəšq　　　-i　　-∅　-**l**-a　　　　(=nəšqi**l**a / *nəšqi**n**a)
　　　　　kiss.IMPF -**B**PL -**S**3 -**L**-3F.SG
　　　　　'they kiss her' (J93:133)

　　　b.　zəbṭ　　　　-i　　-ut　　-**l**-e　　　(=zəbṭut**l**e / *zəbṭut**n**e)
　　　　　catch.IMPF -**B**PL -**S**2PL -**L**-3M.SG
　　　　　'you (pl) catch him' (J93:135)

　　　c.　zəbṭ　　　　-i　　-na　　-**l**-an　　　(=zəbṭina**l**an / *zəbṭina**n**an)
　　　　　catch.IMPF -**B**PL -**S**1PL -**L**-1PL
　　　　　'we catch ourselves' (J93:135)

Note that the L morpheme in these L agreement markers stays *l*-initial even when immediately following an *n*, showing the L morpheme's normal resistance to progressive assimilation (which will be relevant in §3.1.3), (21). (This example involves the Verb-L-L configuration that will be discussed in §3.1.2.)

(21)　　səm　　　　-l-an -**l**-e　　　(=səmlan**l**e / *səmlan**n**e)
　　　　make.PFV -**L**-1PL -**L**-3M.SG
　　　　'we made him' (J93:139)

Examples like (21) could undergo probabilistic REGRESSIVE SONORANT ASSIMILATION in natural speech, but this would derive *səmlalle*, not *səmlanne*.

Historically, all the plural agreement morphemes ended in *n* (N. Patel, p.c.), which helps us understand the origin of the *l/n* alternation, as arising from progressive assimilation. However, there are a number of reasons why such a phonological account cannot extend to the *l/n* alternation in modern-day Turoyo. First of all, a quick glance at Tables 1–2 shows that plural morphemes generally do not end in *n* synchronically in Turoyo. Second, even if there were some kind of covert nasal at the end of every plural morpheme, Turoyo does not have any general process of progressive assimilation (see §2.2.3), and so the L morpheme would not be expected to assimilate to (or be replaced by) a preceding covert nasal—this fact can be verified by observing in (21) that even adjacency with an overt nasal does not result in assimilation. Third, even if the hypothetical covert nasal at the end of every plural morpheme were somehow exceptional in inducing progressive assimilation, it's not clear why this would only happen in L3PL and L2PL. Finally, both sorts of assimilation that Turoyo does have (C-FILLING and probablistic REGRESSIVE SONORANT ASSIMILATION) are bled (blocked) under linear intervention by the mobile past tense morpheme (see §4.2), but the *l/n* alternation persists—it is *not* bled in these environments. I therefore conclude that the *l/n* alternation is morphological, not phonological.

Summarizing thus far, the *l/n* alternation is best characterized as the L morpheme, in certain L agreement markers, having a different form depending on the morphosyntactic features of the preceding morpheme—namely, whether the preceding morpheme is plural or not. This gives us part of the environment for the alternation, PL__. In order to understand why it is that the L morpheme in a plural context is *n* only in the L2PL and L3PL agreement markers (and not for any other persons/numbers), I capitalize on the fact that it is only these two L agreement markers that contain a consonant-initial personal suffix, which can be seen in Table 2. This gives us the other component of the environment for the alternation, __C.

Putting this together, I propose that the L morpheme has the form *n* when preceded by a plural morpheme and followed by a consonant, i.e., in the environment PL__C.

3.1.2 The *l/n* alternation is fully general

All of the examples of the *l/n* alternation above showed the form of the L morpheme being conditioned by plural features on an S morpheme (in the frame PL__C). One might wonder, then, whether the alternation is specific to this exact context, involving S agreement. In fact, the alternation is general: the *l/n* alternation occurs in the context of *any* (immediately) preceding plural feature, not just a plural S morpheme.

There are two places where we find L agreement markers apart from in the canonical verbal complex (Verb-B-S-L). The first context is in plural imperatives (multiple addressees), which lack B and S agreement entirely. Instead, plural imperatives, (22b), are distinguished from singular imperatives, (22a), through the plural imperative suffix, which immediately follows the verb base, and through the length of the stem vowel. The plural imperative suffix surfaces as -*u* when the imperative bears no further suffixes (i.e., no further agreement); note that plural imperative -*u* is distinct in form from B, S, and L agreement (cf. Tables 1–2).

(22) a. mbal   (=mbal)
          take.away.IMPER
          'take away/take hence!' (addressed to you (sg)) (J93:141)
      b. mbāl   -**u**   (=mbālu)
          take.away.IMPER -IMPER.PL
          'take away/take hence!' (addressed to you (pl)) (J93:141)

When an imperative has a dative object, this object appears on the verb in the form of an L agreement marker. Interestingly, in these contexts, the plural imperative -*u* is null, though the long stem vowel of the plural imperative persists. For their part, the L agreement markers behave just as they do in a non-imperative: when L3PL and L2PL follow a plural imperative stem, they are *n*-initial, (23); when L3PL follows a singular imperative stem, it is *l*-initial, (24). (L2PL as an object in a singular imperative is ill-formed, since the addressee is singular.)

(23) a. mbāl   -∅   -**n**-Ce   (=mbāl**ne**)
          take.away.IMPER -IMPER.PL -***L***-3PL
          'take them away!' (addressed to you (pl)) (J93:141)

14

    b.   mbāl   -∅   -**n**-xu   (=mbālə**n**xu)
         take.away.IMPER -IMPER.PL -***L***-2PL
         'take yourselves away!' (addressed to you (pl)) (J93:142)

(24)   mbal   -**l**-Ce   (=mba**l**le)
         take.away.IMPER -***L***-3PL
         'take them away!' (addressed to you (sg)) (J93:141)

A number of phonological rules come into play here in predictable ways: C-FILLING and SHORTENING in (23a) and (24) (much like the derivation shown in (18)), and EPENTHESIS in (23b) (as in (19)).

    The second context where we can see the generality of the *l/n* alternation is when two L agreement markers are stacked. This happens in perfective aspect, where transitive subjects are marked via L agreement rather than B/S agreement, and where certain objects are marked via a second L agreement marker stacked on top of the first. (The precise conditions under which this agreement pattern appears will not concern us here; see Kalin 2018a,b.) The crucial fact is that when two L markers are stacked, and the first L agreement marker is PL, the second L morpheme (if in a L3PL or L2PL marker) appears in its *n* form, (25). (Note that the vowel of the first L agreement marker is reduced to ə because this vowel is unstressed and in a closed syllable. The apparent disappearance of the L morpheme in the first L agreement marker is the topic of the following section, §3.1.3.)

(25)   a.   səm   -l-xu   -**n**-Ce   (=səmxə**n**ne)
           make.PFV -***L***-2PL -***L***-3PL
           'you (pl) made them' (J93:139)

        b.   səm   -l-xu   -**n**-xu   (=səmxə**n**xu)
           make.PFV -***L***-2PL -***L***-2PL
           'you (pl) made yourselves' (J93:139)

The second L agreement marker here is in its *n*-initial form, conditioned by the plurality of the first L agreement marker.

    What imperatives and perfectives show us is that the *l/n* alternation is fully general: when the L morpheme is preceded by any plural feature, and followed by a consonant (as it is in L3PL and L2PL), it appears as the allomorph *n*.

3.1.3   Another allomorph of the L morpheme

There is one final complication to L allomorphy. The surface form of the first L agreement marker in (25a–b) presents us with a puzzle: why does it look like the first L morpheme (the *l*) has disappeared? All other things being equal, we would expect EPENTHESIS to take place here, yielding *səməlxənne* and *səməlxənxu*, preserving that first *l*. Note that this "disappearing *l*" is not an exceptional feature of this example, but rather is a systematic behavior of the L morpheme in L3PL and L2PL *outside of* plural contexts, as will be shown below. This leads me to propose that there is a third allomorph of the L morpheme: the L

morpheme has the form C (empty consonant slot) when it is followed by a consonant, i.e., in L3PL and L2PL, and in a singular environment.

Let's start with L3PL. In (26a), we see again the same "disappearing *l*" as we saw with L2PL in (25). A minimal comparison is provided with the verb in (26b), which serves as a reality check that the L morpheme doesn't generally assimilate to a preceding consonant, nor does it normally disappear entirely.

(26) a. zəbṭ   -∅   -ət   -**l**-Ce   (=zəbṭətte)
          catch.IMPF -**B**M.SG -**S**2SG -**L**-3PL
          'you (masc. sg.) catch them' (J93:135)
      b. zəbṭ   -∅   -ət   -**l**-e   (=zəbṭət**l**e)
          catch.IMPF -**B**M.SG -**S**2SG -**L**-3M.SG
          'you (masc. sg.) catch him' (J93:134)

The derivation in (27) shows that the underlying morphemes as given in (26a) do not lead to the attested surface form (and in fact the predicted form is that of the surface form of (26b)):

(27) Input (26a), first attempt: zəbṭətlCe
      HIATUS RESOLUTION: − − − −
      C-FILLING: zəbṭətlle
      SHORTENING: zəbṭətle
      EPENTHESIS: − − − −
      Output (incorrect):   zəbṭətle

The data above fall into line if the L morpheme has the form C when it precedes a consonant. This would mean that a more accurate representation of the L agreement marker in (26a) is *C-Ce*, and leads to a successful derivation:

(28) Input (26a), revised: zəbṭətCCe
      HIATUS RESOLUTION: − − − −
      C-FILLING: zəbṭəttte
      SHORTENING: zəbṭətte
      EPENTHESIS: − − − −
      Output (correct):   zəbṭətte

Since both consonants in the L agreement marker are empty consonant slots, they both assimilate to the final consonant of the stem, and then undergo SHORTENING, which is what makes it look like the L morpheme disappears.

This same explanation—that the L morpheme has the allomorph C when followed by a consonant—extends to helping us understand the surface form of the L agreement marker in (29), as well as the surface form of the first L agreement marker in (25). (Note that in the morpheme-by-morpheme breakdown in examples from here on out, I represent the L morpheme in this environment as C.)

(29)　nšəq　　-∅　　　-∅　-**C**-xu　　　　(=nšəqxu)
　　　kiss.PFV -***B***M.SG -***S***3 -***L***-2PL
　　　'you (pl) kissed him' (J93:130)

(30)　　Input (29):　　　　　　nšəqCxu
　　　　HIATUS RESOLUTION:　　− − − −
　　　　C-FILLING:　　　　　　nšəqqxu[9]
　　　　SHORTENING:　　　　　nšəqxu
　　　　EPENTHESIS:　　　　　− − − −
　　　　Output:　　　　　　　nšəqxu

Again, here there is C-FILLING followed by SHORTENING, giving the appearance that the L morpheme has disappeared.[10]

　　　What happens when there is no immediately preceding consonant for the *C* allomorph of the L morpheme to assimilate to? In these cases, there seems to be a retreat to the elsewhere *l*, (31).

(31)　a.　nəšq　　　-o　　　-∅　-**C**-Ce　　　(=nəšqa**ll**e)
　　　　　kiss.IMPF -***B***F.SG -***S***3 -***L***-3PL
　　　　　'she kisses them' (J93:133)
　　　b.　nəšq　　　-o　　　-∅　-**C**-xu　　　(=nəšqa**l**xu)
　　　　　kiss.IMPF -***B***F.SG -***S***3 -***L***-2PL
　　　　　'she kisses you (pl)' (J93:133)

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[9]I have shown the empty C getting its features from the preceding consonant, *q*. Nothing will change in the surface form here if *C* in fact gets its features from the following consonant, *x*. However, it seems more generally that the *C* L morpheme de facto never gets its features from a following consonant, only a preceding consonant; this will be clear from the absence of assimilation in (31b), and also plays a role in understanding (6), if we assume this is one and the same DAT/L morpheme. An investigation of the possible reasons for this is outside the scope of this paper.

[10] There are a number of other tempting but ultimately untenable alternative analyses. One set of alternative analyses is that the L morpheme has a zero allomorph pre-consonantally or deletes pre-consonantally. The examples in (31) and (32) will show that these alternatives are not viable, because the L morpheme survives pre-consonantally there, since it is not in a SHORTENING environment.

　　　Another more initially plausible set of alternatives is that L morpheme has a zero allomorph *inter*-consonantally or deletes *inter*-consonantally. There are two arguments against these analyses. One argument appears in the text surrounding (32), where there is feature-spreading across a short vowel, supporting the C analysis. The other argument comes from the fact that we have seen that the L morpheme can survive interconsonantally thanks to EPENTHESIS, (17b) and (23b), which it does just in case the L morpheme is in an *n* environment (PL__C). This is a problem for a deletion analysis of the data in this section, because the deletion operation that targets the L morpheme would have to be tagged to occur only in non-plural environments, making the non-overlap of deletion and the *n* allomorph totally accidental. (Note that it is not plausible to instead constrain EPENTHESIS to occur only in plural environments, since EPENTHESIS is a general phonological process in Turoyo.) (17b) and (23b) are also a problem for a zero allomorph analysis, because both the zero allomorph (hypothetical conditioning environment C__C) and the *n* allomorph (conditioning environment: PL__C) would have their conditioning environments met in these examples; to ensure that the latter environment wins, the *n* allomorph would have to be given precedence over the zero allomorph, an extrinsic ordering that is otherwise unnecessary.

There are two ways to make sense of (31) under the present analysis. First, it could be that there is some surface phonological rule that realizes empty consonant slots (as a last resort) as *l*. This is consistent with being a language-wide rule, though I have found no other context in which it is clearly testable,[11] nor is such a rule particularly cross-linguistically plausible. An alternative analysis is to provide the C allomorph of the L morpheme with a more abstract and complex phonological representation: it could be that this allomorph is actually a C with a delinked *l*, and *l* only links when there's nothing else for C to be filled with;[12] or it could be that the C allomorph is really a "ghost" (phonologically weak) *l*, along the lines of Smolensky and Goldrick 2016, Zimmermann 2019.[13] I will not adjudicate among these analyses.

Finally, there is a striking piece of support for analyzing the L morpheme as an empty consonant slot (of some variety, as per the discussion above) in (31), even though it ends up looking like it's just the elsewhere allomorph *l*. This support comes from a seemingly-spurious *n* form of the L morpheme in one particular environment, exemplified in (32). Note that the B/S morphemes in (32) are not plural, and so the *n* form of the L morpheme is not otherwise motivated.

(32) a. zobaṭ   -∅   -no   -**C**-Ce (=zobaṭna**n**ne)
          catch.IMPF -**B**M.SG -**S**1SG -**L**-3PL
          'I (masc. sg.) catch them' (J93:135)
      b. zobaṭ   -∅   -no   -**C**-xu (=zobaṭna**n**xu)
          catch.IMPF -**B**M.SG -**S**1SG -**L**-2PL
          'I (masc. sg.) catch you (pl)' (J93:136)

Why does the L morpheme surface as *n* here? The empty consonant analysis provides a natural explanation—there is C-FILLING over a short vowel, with the melody coming from the preceding *n*. This apparently does not happen for consonants apart from *n*, a fact which remains mysterious.

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[11]One might wonder about testing this default *l* hypothesis with the plural definite determiner, *ʔaC-*, seen in §2.2.2, but the situation is not so clear. Nouns that look vowel-initial are often actually glottal-initial, and indeed this glottal can be geminated, as in *ʔa**ʔ-ʔ**abn-e* 'the sons' (J93:37). However, Jastrow notes that geminating the glottal is less common than choosing what he calls an allomorph of the plural determiner, *ʔann-*, and prefixing this to the noun (without the initial glottal consonant), leading to a second acceptable realization of 'the sons' as *ʔa**nn**-abn-e*. This could be evidence for a different default realization of an empty consonant slot (as *n* rather than *l*), or it could be that (as Jastrow says) *ʔann-* is a suppletive allomorph of the plural definite determiner. A perhaps even more intriguing alternative is that the *n* that surfaces here is related to the appearance of *n* in the environment PL__C that we saw for the L morpheme—note that the environment of (the first) *n* in the plural determiner is nearly identical to the environment for the L morpheme's *n* allomorph. Pushing this idea even further, perhaps glottal-inital nouns are in fact "ghost"-glottal initial or C initial, with a delinked glottal stop.

[12]Thank you to the Montreal-based WORDS reading group for this suggestion.

[13]Thank you to Nicholas Rolle for this suggestion.

3.1.4 Interim summary of L allomorphy

In the preceding sections, I have motivated the following three allomorphs of the L morpheme (repeated from (13)):

(33)   L → n / PL__C   (= n when following PL and preceding a cons)
          C / __C   (= empty C slot when preceding a consonant)
          l /   (= l elsewhere)

I assume that the most specific allomorph (i.e., the one with the most specific environment met) is the one that is chosen; since the environment that conditions the C allomorph is a proper subset of the environment that conditions n, n will appear whenever its more specific environment is met. In practice, both the C and n allomorphs will only ever surface when the personal suffix in the L agreement marker is 2PL or 3PL, because these are the only personal suffixes that are consonant-initial.

3.1.5 L allomorphy is opaque and non-optimizing

The allomorphs of the L morpheme, given in (33) above, cannot be understood as phonologically-motivated—it is opaque, non-optimizing, and cannot be the result of regular phonological processes. The latter point was addressed toward the end of §3.1.1—given the full range of data (some of which is to come in §4), there is no plausible way to derive the l/n alternation purely phonologically, e.g., by positing covert nasals associated with every plural morpheme.

As for phonological optimization, even though part of the conditioning environment for the allomorphs of L is phonological (__C), the choice of allomorph cannot be made by considerations of phonological well-formedness. For example, in many cases, the output would be just as well-formed with the elsewhere allomorph as the conditioned allomorph, as in (16): the hypothetical elsewhere allomorph form would be *zəbṭinalle*, as compared to the attested n allomorph form *zəbṭinanne*—both equally (un)marked. In other cases, the input might have needed a phonological "repair" with the elsewhere allomorph, and still does with the conditioned allomorph, as seen with epenthesis in (17b): the hypothetical elsewhere allomorph form is *zəbṭutəlxu*, vs. the attested n allomorph form *zəbṭutənxu*, vs. the hypothetical C allomorph form *zəbṭutxu* (which would require C-FILLING and SHORTENING rather than EPENTHESIS). Phonological considerations do not adjudicate among the allomorphs. (This is expanded on in more detail in §5.2.)

Finally, the choice of allomorph for the L morpheme is often opaque on the surface, as the phonological environment for its insertion is no longer present after phonological processes have taken place. This is the case, for example, for (26a), repeated in (34) (with the hypothesized C allomorph of the L morpheme in this context).

(34)   zəbṭ   -∅   -ət   -**C**-Ce   (=zəbṭət**t**e)
         catch.IMPF -***B***M.SG -***S***2SG -***L***-3PL
         'you (masc. sg.) catch them' (J93:135)

The environment for the choice of the C allomorph of the L morpheme is when the L morpheme precedes a consonant; but the L morpheme does not precede a consonant on the surface (bolded) in (34), due to SHORTENING. To see an example involving the n allomorph, we can look to (17a), repeated below in (35).

(35) zəbṭ -i -ut **-n**-Ce (=zəbṭut**n**e)
   catch.IMPF -***B***PL -***S***2PL -***L***-3PL
   'you (pl) catch them' (J93:135)

Again, the n on the surface does not precede a consonant, and so the environment for the choice of the n allomorph (PL__C) is not met on the surface, only underlyingly.

 The facts as they stand follow naturally from a model of the morphology/phonology interface in which allomorph choice precedes the phonological component of the grammar, and so is oblivious to phonological considerations. However, this data alone is not a knock-down argument against making morphological choices alongside phonological ones altogether: I will return to this data in §5.2 and show formally that an M»P (though not P»M) OT account can capture the basic allomorphy facts. It will be the data in §4, involving the displaced past tense morpheme, that will provide an argument against *both* P»M and M»P types of accounts, §5.3.

3.2 B allomorphy

The second case of allomorphy in the verbal complex is found in the B agreement paradigm, in particular, when B agreement encodes a plural, as schematized informally in (36).

(36) a. BPL → -*ən* / __CC   (J93:127)
   b. BPL → -*i* / __{CV, V, #}

I take -*i*, (36b), to be the elsewhere form of BPL, and we have already seen it appear in its __CV environment, e.g., in (16), and its (opaque) __V environment, e.g., in (17); an additional example, showing this allomorph appear word-finally, is given in (37).

(37) gaḥik **-i** -∅ (=gaḥik**i**)
   laugh.PFV -***B***PL -***S***3
   'they laughed' (J93:129)

 BPL has a phonologically-conditioned suppletive allomorph, -*ən*, which surfaces when BPL precedes a CC sequence, (36a). Given the pieces of suffixal inflection, Tables 1–2, this arises only in two very specific situations, namely, when both S agreement is null (so 3rd person) and the L agreement marker begins with two consonants, which brings us back to our old friends from §3.1, L3PL and L2PL. The allomorph -*ən* is shown in its two __CC environments in (38).

(38) B/S3PL preceding L3PL and L2PL

    a.   nəšq   **-ən** -$\emptyset$[14] -n-Ce   (=nəšqə**n**ne)
        kiss.IMPF -***B***PL -***S***3 -***L***-3PL
        'they kiss them' (J93:127)

    b.   nəšq   **-ən** -$\emptyset$ -n-xu   (=nəšqə**n**xu)
        kiss.IMPF -***B***PL -***S***3 -***L***-2PL
        'they kiss you (pl)' (J93:127)

Notably, the choice of -ən creates a phonotactic problem where there would not have been one if elsewhere -i were chosen, requiring SHORTENING to resolve it. The derivation of (38b) is shown in (39).

(39)   Input (38b):   nəšqənnxu
           HIATUS RESOLUTION: − − − −
           C-FILLING: − − − −
           SHORTENING: nəšqənxu
           EPENTHESIS: − − − −
           Output: nəšqənxu

If -i were chosen as the allomorph of BPL in (39), there would be no unsyllabifiable consonant cluster at all. This makes the allomorph-choice here anti-optimizing, or "perverse" in Paster's (2006) words.

    It is important to note that the SHORTENING that takes place in (39) means that on the surface, there is essentially no evidence that there is allomorphy of BPL at all; instead, it could just be a purely phonological process: vowel reduction of the elsewhere plural allomorph -i to -ə in a closed syllable. If this could just be a case of vowel reduction, then why posit BPL allomorphy at all? The answer is because there is a context where BPL -ən surfaces intact, and that is when the verb is in the past tense. The past tense morpheme, -wa, which will be discussed extensively in §4, is completely ignored for the purposes of allomorph-choice, even when it linearly intervenes in the conditioning environment of the allomorph. Thus we see all three consonants that enter into the underlying cluster in (38)/(39) can survive on the surface, (40):

(40)   a.   nəšq   **-ən** -$\emptyset$ -wa -n-Ce   (=nəšqə**n**wanne)
           kiss.IMPF -***B***PL -***S***3 -PST -***L***-3PL
           'they used to kiss them' (J93:134)

      b.   nəšq   **-ən** -$\emptyset$ -wa -n-xu   (=nəšqə**n**wanxu)
           kiss.IMPF -***B***PL -***S***3 -PST -***L***-2PL
           'they used to kiss you (pl)' (J93:134)

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[14]I assume that the S suffix, though not overtly displaying a number distinction in 3rd person, cf. Table 2, still abstractly contains number in 3rd person, and hence conditions the L allomorph *n*, §3.1. Alternatively, it could be that the *n* allomorph is conditioned by plural on the closest *overt* morpheme (à la Embick 2010), B agreement.

In order to understand the forms in (40), we must recognize the distinct *-ən* allomorph of BPL—there is no general process of nasal-insertion (or deletion) in Turoyo that could account for the appearance of this unexpected *n* before the past tense morpheme, nor could there be a phonotactic explanation for it: in (40), the *n* creates a more marked syllable structure than elsewhere *-i* would have (as it creates a closed syllable).[15]

Two alternative hypotheses about *-i/-ən* allomorphy are worth addressing and ruling out. The first attempts to capitalize on the fact that the only CC-initial L agreement markers are L2PL and L3PL. Thus, one might wonder whether BPL allomorphy is better characterized as being featurally-triggered, namely, when followed by a plural non-1st person, rather than being phonologically-triggered. This makes the prediction that BPL allomorphy should be triggered *whenever* the following morpheme is plural non-1st person, including when S agreement marks a plural non-1st person. However, this prediction is incorrect, as such an environment in fact does not trigger the *-ən* allomorph, as can be seen in (41a) for a 3rd person plural S morpheme and (41b) for 2nd person plural S morpheme; the elsewhere allomorph *-i* persists in this environment. (In (41b), HIATUS RESOLUTION obscures the plural B morpheme on the surface; but there would have been no hiatus at all if the allomorph here were *-ən*.)

(41) a. nəšq   **-i**   -∅   -l-a   (=nəšqila, *nəšqənla)
          kiss.IMPF -*B*PL -*S*3 -*L*-3F.SG
          'they kiss her' (J93:133)

      b. zəbṭ   **-i**   -ut   -l-e   (=zəbṭutle; *zəbṭənutle)
          catch.IMPF -*B*PL -*S*2PL -*L*-3M.SG
          'you (pl) catch him' (J93:135)

The examples in (41) feature plural B agreement followed immediately by a plural non-1st person S morpheme, and yet the elsewhere allomorph *-i* is chosen. The *-ən* allomorph therefore cannot be understood as occurring in a featurally-defined environment, as it is not triggered in (41).

A second alternative hypothesis, from what we have seen so far, is that it could be that BPL takes the form *-ən* when preceding the past tense morpheme. This, too, can readily be shown to be incorrect:

(42) zəbṭ   **-i**   -wa -na   -l-a   (=zəbṭiwaynala)[16]
      catch.IMPF -*B*PL -PST -*S*1PL -*L*-3FS
      'we used to catch her' (J93:136)

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[15]The reader can now see why I did not include 3rd person plural examples in §3.1, as the cases of the *n* allomorph of the L morpheme in (40) look like they could simply be derived with the *C* allomorph of the L morpheme concatenated with the BPL allomorph *-ən*. §4 will show that this cannot be the right characterization, even in these examples, because of the differential behavior of C-FILLING and suppletive allomorphy with respect to the intervention of past tense *-wa*.

[16]The past tense morpheme *-wa* has the form *-way* when it precedes CV. This variation in *-wa*'s form will be discused in §4.

The *-ən* allomorph cannot be understood as occurring in the environment __[PAST], as it is not triggered in (42). (It is only triggered when what *follows* past tense is L3PL or L2PL, i.e., a CC sequence.)

Summing up what we have seen so far, the best possible unified characterization of the *-ən* allomorph is that it appears in the environment __CC. Allomorphy of BPL is summarized in (43).

(43)   BPL → *-ən* / __CC   (= *-ən* before two consonants or a long consonant)
         -i /   (= *-i* elsewhere)

The choice of the conditioned allomorph *-ən* is *always* surface-opaque. In non-past verbs, like (38), the CCC sequence is simplified by SHORTENING, which obscures the allomorph of BPL: it looks like it is just *-ə*, concurrent with the *n* allomorph of the L morpheme. The *environment* that triggers BPL allomorphy is also opaque in such examples, as on the surface, the *-ən* allomorph does not precede CC, but rather CV (*xu* or *ne*). In past tense verbs, like (40), the *-ən* allomorph does not precede CC, but rather the CV form of the past tense suffix, *-wa*, yet another layer of opacity.[17]

3.3 An aside: The structure of the verb word

Before turning to the past tense morpheme, an additional remark is in order about the *directionality* of the allomorphy motivated above. Both L and B allomorphy are at least in part phonologically-conditioned, and in both cases, the phonological trigger is *further* from the root of the word than the allomorph—these suppletive allomorphs are sensitive to (conditioned by) what looks like outer phonological material. This is surprising, given a particular crosslinguistic generalization about when allomorphy can have a phonological trigger (Carstairs 1990, Bobaljik 2000, Paster 2006, *i.a.*): generally speaking, suppletive allomorphy that is conditioned by phonology can be "inwardly" sensitive, but not "outwardly" sensitive; in other words, a morpheme may have a suppletive form based on the phonological properties of elements that are *more embedded* than the morpheme itself, but not *less embedded*.[18] A common explanation for this generalization that holds across morphological frameworks (see, e.g., Kiparsky 1982, Carstairs 1987, Anderson 1992, Halle and Marantz 1993, Bobaljik 2000) is that words are in some sense phonologically built from the most-embedded part (typically the root) to the least-embedded part. It thus follows naturally that an outer morpheme can only be sensitive to (can only "see") the phonology of a morpheme that is more deeply embedded.

[17]One might wonder whether it is simpler to just take all of the suffixes after the verb to form a long portmanteau morpheme, subsuming both B and L allomorphy. Such an analysis would require the speaker to memorize well over 200 portmanteau forms (and ignore a number of generalizations), and so I do not take this to be a plausible analysis of the data.

[18]There are, of course, a few at least purported counter-examples. See e.g. Carstairs (1990) and Deal and Wolf (2017) for a few counter-examples and ways to understand them without (at least fully) abandoning the larger generalization.

To illustrate, I will use a quick example from Turkish (drawn from Paster 2006:55, who cites Lewis 1967, Haig 2004). In Turkish, the causative suffix has two suppletive allomorphs, *-t* and *-DIr*.[19] *-DIr* is the elsewhere allomorph, while *-t* appears following polysyllabic stems that end in a vowel, /r/, or /l/. We can observe this allomorphy in cases where the stem is the verb root, like *bekle-t* 'wait-CAUS' ("cause to wait"), with the conditioned allomorph *-t*, and *ye-dir* 'eat-CAUS' ("feed"), with the elsewhere allomorph. We can also observe this allomorphy in cases where there is a complex stem, e.g., in double causatives like *ye-dir-t* 'eat-CAUS-CAUS' ("cause to feed"); the inner causative morpheme is in its elsewhere form (*-DIr*), because the verb root is monosyllabic, while the outer causative morpheme is in its conditioned form (*-t*), because the complex stem it attaches to is polysyllabic and ends in /r/. This allomorphy of the causative suffix in Turkish, which is sensitive *inward*, to the phonology of more deeply embedded morphemes, is the kind of phonologically-conditioned allomorphy that is expected and well-attested.

Working just from the basic information about Turoyo verbs provided in §2, and with no deeper investigation of the language, one might posit a structure for the canonical Verb-B-S-L example in (1) that looks like (44), with the verb root being the most deeply embedded piece, and the L agreement marker being the least embedded. (I put aside the aspectual vowel pattern here, as well as the internal structure of the L agreement marker.)

(44)   Hypothetical Turoyo verb structure (to be rejected)

$$X^0$$

| Verb	*BAgr*	*SAgr*	*LAgr*
CATCH	*B*F.SG	*S*2SG	*L*-3M.SG
zbṭ	-o	-ət	-l-e
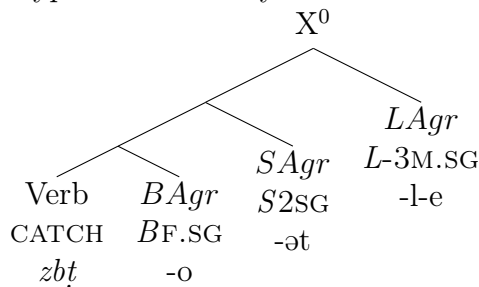
This structure is problematic when considered with respect to (at least) B allomorphy—as I have shown in this section, the form of B agreement is sensitive to the phonological form of S and L agreement; with a structure like (44), this allomorphy would be *outwardly* sensitive to phonology. In order for this to be possible derivationally, the phonological word would need to be built starting from the *highest* morpheme rather than the lowest.

The facts of phonologically-conditioned allomorphy in Turoyo are enough to reconsider whether (44) is the right structure for the verb word. But in fact a fully distinct argument from split-ergativity and agreement restrictions in Turoyo also supports the rejection of (44) as the structure of the verb word (Kalin 2018a,b). In very (very) brief, when B/S agreement indexes an object, which happens in perfective aspect, the object is restricted to 3rd person. L agreement, on the other hand, is not associated with any person restrictions, whether it indexes a subject or object. A common source hypothesized to be responsible for person

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[19]Capital letters indicate predictable phonological variation, where *D* can be [t, d] and *I* can be different high vowels.

restrictions is the presence of an intervener between an agreeing head and the argument it agrees with (along the lines of Person Case Constraint effects; Béjar and Rezac 2003, *i.a.*). The word-internal structure in (44) reflects a syntactic structure where B/S agreement is lower than L agreement; in such a structure, it is not clear how it would come about that BAgr/SAgr have a *more* restricted agreement relationship with an object as compared to the syntactically higher (i.e., further away from the object) LAgr. Rather, the person restriction facts suggest that it is B/S agreement that is syntactically high (and thus subject to intervention), while L agreement is low. The motivated syntactic structure is roughly schematized in (45).

(45)
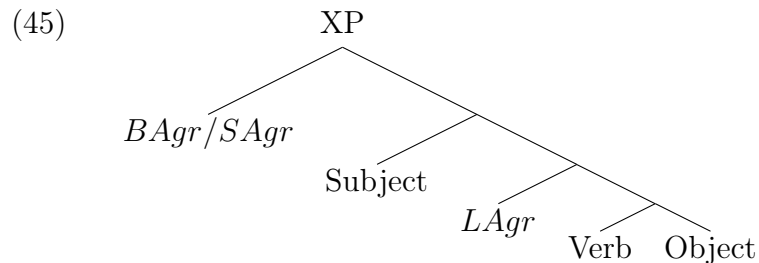
In Kalin (2018a), I consider several paths to the wordhood of the verbal complex from the underlying syntactic structure in (45). For concreteness, I will adopt one of these possibilities here, namely that there is traditional head movement (Travis 1984) combined with a general operation of Merger Under Adjacency (Marantz 1984, Bobaljik 1994, Harley 2013, *i.a.*). Inspired by an analysis of Cupeño verbs (Barragan 2003, Harley 2013), this approach would have LAgr raise to the position of BAgr/SAgr (adjoining to them) in the syntax, (46a). (For completeness, I show the subject raising from its base position to a high clausal position.) In the post-syntax, the verb merges-under-adjacency with the linearly adjacent head-complex (BAgr/SAgr-LAgr), adjoining at the X^0 level and left-aligning to it, producing the morphological structure in (46b). (*nb.* Lowering the internally-complex BAgr/SAgr node to V after (46a) would also produce (46b).) The analysis here is reminiscent of Speas (1991) and Rice (2000) on (apparently) mirror-principle-violating Athapaskan verbs.

(46)   a.

25

b.

$$X^0$$

Verb

$BAgr/SAgr$ $LAgr$
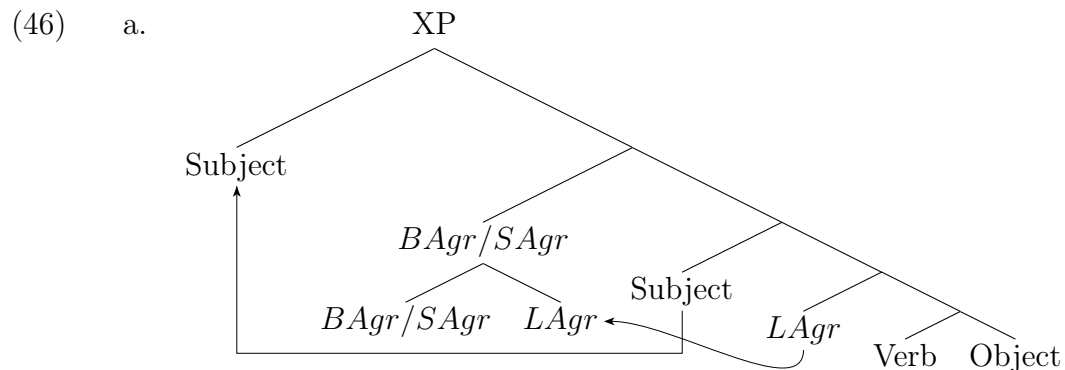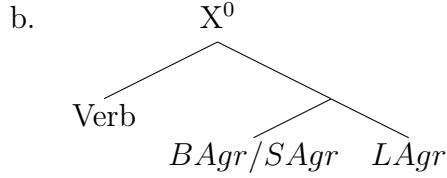
The structure and derivation in (46) gets the morphemes in the right order, while respecting the underlying syntactic structure that is motivated by person restrictions in the perfective, (45). (46) also solves the outward-sensitivity puzzle: counter to appearances, the verb base is *not* the most embedded component of the verb word; rather, L agreement is the most embedded. The plural B morpheme is thus actually *inwardly-sensitive* to the phonological forms of S and L agreement, and so is not exceptional at all in this respect.

The crucial takeaway here is that both allomorphy and agreement restrictions converge in supporting a structure in which B agreement is morphosyntactically high and L agreement is low. For a concrete, more articulated word structure going forward, I adopt (47) as the representation of the morphological structure of a canonical Turoyo verb. I treat the L morpheme component of L agreement as a sort of KP case layer containing the personal suffix, consistent with the function of the L morpheme as dative case elsewhere.

(47)

$$X^0$$

Verb
CATCH
zbṭ

$BAgr$
BF.SG
o

$SAgr$
S2SG
ət

$LAgr$
L 3M.SG
l   e
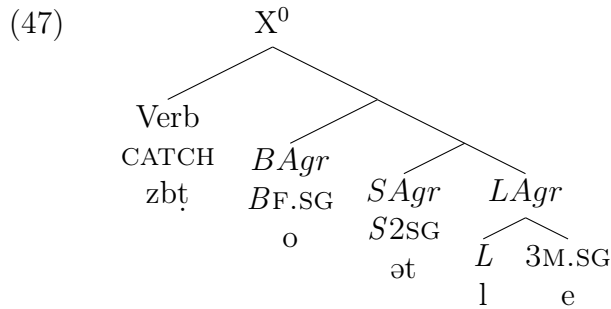
4   Morphology before phonology: The argument from displacement

The previous section motivated two cases of allomorphy in the verbal complex, repeated for easy reference in (48)–(49), and showed that they are neutral or "perverse" with respect to phonological optimization, and may be opaque.

(48)   L → n / PL__C   (= n when following PL and preceding a cons)
          C / __C   (= empty C slot when preceding a consonant)
          l /   (= l elsewhere)

(49)   BPL → -ən / __CC   (= -ən before two consonants or a long consonant)
          -i /   (= -i elsewhere)

We turn now to the most revealing aspect of Turoyo verbal morphology with respect to illuminating the morphology-phonology interface, the behavior of the past tense morpheme,

-wa. As we will see in §4.1, -wa has a variable surface position, sometimes appearing between B and S agreement and sometimes between S and L agreement. §4.2 shows that allomorphy proceeds as though -wa were not there, which is especially surprising with respect to phonologically-conditioned B allomorphy, since -wa intervenes in its conditioning environment. Whereas -wa seems to be invisible to morphological processes, it is fully visible for all phonological processes, and the data show clearly that there must not be any earlier phonological cycle without -wa.

In §4.3, building on the observations in §4.1–2, I propose that -wa morphosyntactically originates between the verb stem and B agreement, and displaces to a phonologically-calculated position within the agreement complex. The displacement of -wa happens *after* exponents are chosen but *before* general phonological operations apply. §4.4 runs through two sample derivations, putting all the pieces of the account together.

4.1   The variable position of **-wa**

The past tense morpheme in Turoyo, -wa, always follows the verb stem, but may come between the B and S agreement morphemes, or may immediately follow the S morpheme. L agreement markers, which always come after -wa, never impact -wa's placement. The two surface linear positions of -wa in the canonical verbal complex are given in (50).

(50)   Two linear positions of -wa
   a.   Verb-B-wa-S-L
   b.   Verb-B-S-wa-L

In cases where B and S agreement are absent, e.g., in double-L constructions, §3.1.2, -wa still precedes all instances of L agreement, Verb-wa-L-L.

Whether -wa appears in its pre-S (50a) position or post-S (50b) position depends on the particular B and S agreement present. The complete set of possibilities is shown in Table 4. Some notes to aid in reading this table: (i) each row presents a different φ-feature set for the subject of the intransitive verb 'laugh', in perfective (recall that B and S always agree with the same argument); (ii) each column lays out (in surface linear order) the morphemes that are part of the verbal complex for that row's particular φ-feature combination; (iii) the last column gives the surface form of the complete verb, after phonological processes have taken place; (iv) for simplicity, I have chosen an example with no L agreement, since L agreement doesn't impact -wa's position; and (v) as noted in fn. 16, -wa has the surface form -way before CV—in this table, that environment is only found in the 1st person, but when L agreement is present, this can also create the environment for -way in other persons.

As can be seen in Table 4, -wa appears between B and S agreement in the 1st person, but after S agreement in the 2nd person (J93:150); it is impossible to tell whether -wa precedes or follows S agreement in the 3rd person. But, there are other possible characterizations of the placement of -wa that are phonological in nature—note that the underlying form of S agreement is consonant-initial in the 1st person, but vowel-initial in the 2nd person. I will return to formalizing a phonological characterization of -wa's placement in §4.3.

27

Table 4: Surface position of -wa in the verb (p. 154)

$B+S$	'laugh.PFV'	B	PAST	S	PAST	surface form
1M.SG	gaḥik	-∅	-wa	-no		= gaḥək**way**no
1F.SG	gaḥik	-o	-wa	-no		= gaḥiko**way**no
1PL	gaḥik	-i	-wa	-na		= gaḥiki**way**na
2M.SG	gaḥik	-∅		-ət	-wa	= gaḥikət**wa**
2F.SG	gaḥik	-o		-ət	-wa	= gaḥikat**wa**
2PL	gaḥik	-i		-ut	-wa	= gaḥikut**wa**
3M.SG	gaḥik	-∅	(-wa)	-∅	-wa	= gaḥək**wa**
3F.SG	gaḥik	-o	(-wa)	-∅	-wa	= gaḥiko**wa**
3PL	gaḥik	-i	(-wa)	-∅	-wa	= gaḥiki**wa**

4.2 Allomorphy, phonological processes, and -wa

The most remarkable fact about -wa is its differential behavior with respect to morphological processes and phonological processes. As this section will demonstrate, phonological processes (unremarkably) treat -wa as a normal and integrated part of the verb word—-wa in its surface position factors into all phonological processes—whereas allomorph choice (remarkably) proceeds as though -wa were not there.

Let's start with an examination of phonological processes and -wa. In present tense (51a), there are two phonological processes taking place: C-FILLING with the features of t, and subsequent SHORTENING. In the past tense form of this verb, (51b), -wa's appearance bleeds both processes—so instead, C receives its default realization as l (see the discussion around (31)), and no SHORTENING is triggered.

(51) a. zəbṭ   -∅   -ət   -**C**-**C**e   (=zəbṭətte)
          catch.IMPF -BM.SG -S2SG -L-3PL
          'you (masc. sg.) catch them' (J93:135)

      b. zəbṭ   -∅   -ət   -wa -**C**-**C**e   (=zəbṭətwa**ll**e)
          catch.IMPF -BM.SG -S2SG -PST -L-3PL
          'you (masc. sg.) used to catch them' (J93:135)

The phonology "sees" -wa in its surface position, and there must not have been an earlier cycle of phonology without -wa. If -wa took its surface position after some or all phonological processes had taken place, we would expect C to assimilate to t in (51b), resulting in a surface form like zəbṭətwate (if SHORTENING also took place before -wa's placement) or zəbṭətwatte (if -wa were inserted after C-FILLING but before SHORTENING), but this is not what we find. Similarly, REGRESSIVE SONORANT ASSIMILATION is bled (blocked) by -wa—it cannot occur across -wa, just like C-FILLING.[20]

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[20]Thinking back to §3.1 on L allomorphy, this new evidence means that any account of the l/n alternation of the L morpheme cannot be purely phonological, hypothetically triggered by a floating nasal that is (in

Along the same lines, the pair of verbs in (52) shows that LOWERING too is bled by -*wa*, as there is LOWERING in present tense (52a) but not in past tense (52b).

(52) a. nəšq   -**o**   -∅ -C-Ce   (=nəšq**alle**)
         kiss.IMPF -***B***F.SG -***S***3 -***L***-3PL
         'she kisses them' (J93:133)

     b. nəšq   -**o**   -∅ -wa -C-Ce   (=nəšq**owalle**)
         kiss.IMPF -***B***F.SG -***S***3 -PST -***L***-3PL
         'she used to kiss them' (J93:133)

If LOWERING occurred before -*wa* took its surface linear position, we would expect *nəšqawalle* in (52b), but again this is not what we find. -*wa* is consistently visible to the phonology, and again, the data shows that there must not have been a cycle of phonology without -*wa* in its surface obvious position.

Unlike phonological processes, allomorphy of the agreement morphemes is completely impervious to (unaffected by) -*wa*. Perhaps the less surprising case comes from the persistence of the *n* allomorph of the L morpheme across -*wa*. Recall from §3.1 that L has the allomorph *n* in the environment PL__C. When the plural in the triggering environment is a 2nd person plural, -*wa* intervenes between the plural S morpheme and the L morpheme (see -*wa*'s position in the 2PL row in Table 4)—on the surface, the L morpheme's environment is PL-*wa*__C. Since -*wa* linearly disrupts the environment for choosing *n*, we might therefore expect this allomorph to be bled by the appearance of -*wa*, with the elsewhere allomorph *l* or the preconsonantal allomorph *C* appearing instead. However, the minimal pairs in (53)–(54) show clearly that this is not what we find:

(53) a. zəbṭ   -i   -ut   -**n**-Ce   (=zəbṭut**ne**)
         catch.IMPF -***B***PL -***S***2PL -***L***-3PL
         'you (pl) catch them' (J93:135)

     b. zəbṭ   -i   -ut   -wa -**n**-Ce (=zəbṭutwa**nne**)
         catch.IMPF -***B***PL -***S***2PL -PST -***L***-3PL
         'you (pl) used to catch them' (J93:135)

(54) a. zəbṭ   -i   -ut   -**n**-xu   (=zəbṭutə**n**xu)
         catch.IMPF -***B***PL -***S***2PL -***L***-2PL
         'you (pl) catch yourselves' (J93:135)

     b. zəbṭ   -i   -ut   -wa -**n**-xu (=zəbṭutwa**n**xu)
         catch.IMPF -***B***PL -***S***2PL -PST -***L***-2PL
         'you (pl) used to catch yourselves' (J93:135)

Even though -*wa* intervenes between the L morpheme and the preceding plural in (53b) and (54b), *n* is still the allomorph that is chosen. Note that since the trigger here is a mor-

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most cases covertly) attached to every plural morpheme. If this were the right account of the *n* allomorph, then *n* allomorphy should be bled by -*wa* just like all other assimilation is, but, as we will see, *n* allomorphy is *not* bled by -*wa*.

phological feature (plural), some formulations of locality actually do permit this allomorphy to persist across an intervener (see, e.g., Bobaljik 2000, Harley and Choi 2016, cf. Embick 2010), and so this is not as of yet particularly surprising.

The more surprising data comes from the persistence of phonologically-conditioned allomorphy across -*wa*. This is found with -*i*/-*ən* allomorphy of the Bᴘʟ morpheme, §3.2, where -*ən* appears in the environment __CC. As should be clear from §4.1, -*wa* will always appear between the plural B morpheme and any L agreement markers, including those that provide the CC environment for Bᴘʟ -*ən*—the surface string of the environment for Bᴘʟ in the past tense is __-*wa*-CC, when the L agreement markers are 3ᴘʟ or 2ᴘʟ. As shown first in (40) and repeated in minimal pairs below, -*wa* nevertheless does not bleed B allomorphy:

(55) a. nəšq   **-ən** -∅ -n-xu   (nəšqə**n**xu)
          kiss.ɪᴍᴘꜰ -***B***ᴘʟ -***S***3 -***L***-2ᴘʟ
          'they kiss you (pl)' (J93:127)

      b. nəšq   **-ən** -∅ -wa -n-xu   (=nəšqə**n**wanxu)
          kiss.ɪᴍᴘꜰ -***B***ᴘʟ -***S***3 -ᴘꜱᴛ -***L***-2ᴘʟ
          'they used to kiss you (pl)' (J93:134)

(56) a. nəšq   **-ən** -∅ -n-Ce   (=nəšqə**n**ne)
          kiss.ɪᴍᴘꜰ -***B***ᴘʟ -***S***3 -***L***-3ᴘʟ
          'they kiss them' (J93:127)

      b. nəšq   **-ən** -∅ -wa -n-Ce   (=nəšqə**n**wanne)
          kiss.ɪᴍᴘꜰ -***B***ᴘʟ -***S***3 -ᴘꜱᴛ -***L***-3ᴘʟ
          'they used to kiss them' (J93:134)

If -*wa* were in its surface linear position when the allomorph of Bᴘʟ were chosen, we would expect elsewhere -*i* to surface, giving us (counter to fact) *nəšqiwanxu* for (55b) and *nəšqiwanne* for (56b).

Unlike the morphologically-conditioned allomorphy in (53)/(54), which could potentially be expected to happen across an intervening morpheme, phonologically-conditioned allomorphy is *not* expected to behave this way under any theory of locality—in the absence of the right phonological environment, the allomorphy should not take place. Since phonologically-conditioned allomorphy *does* persist across -*wa* here, an explanation is called for.

4.3   Analysis of -**wa**

Putting together the observations in §4.1 and §4.2, -*wa* apparently draws a dividing line between what is phonological and what is morphological—the morphology ignores -*wa*, while the phonology doesn't. More precisely, -*wa* does not seem to be in its surface (intervening) position at the point of exponent choice, but *is* in its surface position by the time phonological processes apply. This state of affairs is only understandable if exponent choice is separate from and precedes phonology; the morphology and phonology must *not* be collapsed in one grammatical module.

In this section, I work out the details of how and when in the derivation the past tense morpheme -*wa* takes its surface position. I will argue that the morphosyntactic position of past tense is hierarchically above the agreement cluster (§4.3.1), that past tense displaces from this position after the agreement morphemes have been exponed, but before phonological processes apply (§4.3.2), and that this displacement is to a (morpho-)phonologically determined position (§4.3.3). I further propose that past tense itself is also exponed (as -*wa*) prior to its displacement (§4.3.4).

4.3.1 Morphosyntactic position: past tense is outside of the agreement series

I begin with the observation from §4.2 that -*wa* does not disrupt allomorphy of the agreement morphemes. In order for B agreement to have a suppletive form that is conditioned by the phonological forms of S and L agreement, even in the past tense, there must be some level of representation where the past tense morpheme does not intervene in this agreement complex at all. Thus, I propose that past tense is morphosyntactically *higher* than the agreement morphemes. The proposed underlying position of past tense in the verbal complex is shown in (57), which is an expansion of (47) from §3.3. (I also assume that (57) is produced by the same morphosyntactic derivation discussed in §3.3: there is raising of LAgr up to T, and this head complex then merges-under-adjacency with V.)

(57)
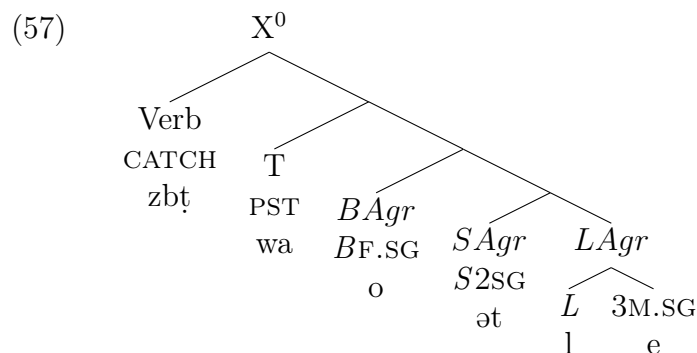
The most important feature of (57) is that the agreement cluster is not interrupted by past tense; the agreement morphemes are in their usual morphosyntactic configuration with respect to each other.

4.3.2 Timing: -*wa* displaces after exponent selection for agreement, and before any earlier phonological cycle

Based on the structural position of past tense in (57), we would expect it to appear linearly between the verb stem and B agreement, V-*wa*-B-S-L. However, we know from §4.1 that -*wa* appears either directly before or directly after S agreement (whenever there are enough overt and present morphemes to determine this precisely). Thus, the past tense morpheme must displace from its morphosyntactic position at some point. When, exactly, does this happen?

Given the allomorphy facts of §4.2, the displacement of the past tense morpheme must crucially happen after exponents have been selected for agreement. This timing guarantees

that all suppletive allomorphy among the pieces of agreement will proceed as usual, since past tense is morphosyntactically outside of the agreement cluster.

Recall, now, the evidence in terms of phonological processes from §4.2: there must *not* be a cycle of phonology that applies to the agreement cluster prior to the past tense morpheme taking its surface position; -*wa* feeds/bleeds all general phonological processes. It therefore must be that past tense displaces to its surface position *before* any earlier general phonological cycle.

Putting together the picture thus far: the past tense morpheme moves to its surface linear position after exponent selection for (at least) agreement, and before any earlier general phonological cycle.

4.3.3 Linear (re-)positioning: -wa's placement is (morpho-)phonological, but precedes phonology

In §4.1, it was noted that one possible characterization of -*wa*'s placement is that -*wa* precedes S agreement when the S morpheme is 1st person, and follows it when it is 2nd person. This suggests a featurally-triggered, morphosyntactic account of -*wa*'s displacement, along the lines of Lowering (Embick and Noyer 2001). However, the timing facts discussed above— in particular, that displacement of -*wa* must follow exponent choice—rule out this type of account, because such morphosyntactic movement should *precede* exponent choice. I therefore do not pursue a characterization along morphosyntactic lines, and turn instead to a mainly phonological account.

Since exponents for all the agreement morphemes must have been chosen prior to the displacement of past tense, it is natural that -*wa*'s repositioning can reference the phonological forms of the agreement morphemes. I pursue two possible (morpho-)phonological characterizations of -*wa*'s displacement. I will not adjudicate between these, but what is crucial is that both rely on the *underlying* forms of the agreement morphemes and the visibility of morpheme boundaries, and thus -*wa*'s displacement is opaque on the surface. Both characterizations are also phonologically non-optimizing. These shared components of -*wa*'s displacement have two implications: (i) as already discussed earlier, there must not be any *earlier* phonological cycle before -*wa* takes its surface position; and (ii) more significantly, -*wa* must also *get to* its surface position prior to (and not concurrent with) the general phonological computation.

The first (morpho-)phonological characterization that I pursue starts with the observation that -*wa* follows S agreement when the S morpheme is vowel-initial, and precedes it when it is consonant-initial. This can be modeled as a sort of iterative Local Dislocation-like movement (similar to the mechanism as proposed by Embick and Noyer 2001, but with an exponent being able to move successively), where -*wa* successively inverts with any adjacent vowel-initial morpheme—-*wa* will always invert with any overt B morpheme, since they're all vocalic, and will further invert with the S morpheme when the S morpheme is vowel-initial. Referring back to Table 4, it can be seen that this dislocation must be calculated based on the *underlying*, and not surface form of the S morpheme: the deletion of the S morpheme's initial vowel in 2F.SG renders this affix consonant-initial on the surface, but -*wa* still inverts

with it. Note that -*wa* will never further invert with L agreement, because L agreement (the L morpheme plus the personal suffix) is always consonant-initial.

The second possible (morpho-)phonological characterization is that -*wa* moves to the closest position where it does not precede a vowel and does not break up a morpheme, giving it a sort of negative subcategorization frame; this takes the movement of -*wa* to be similar to infixation, though with a nonstandard (negative) pivot. Since all of the overt B morphemes consist of a single vowel, -*wa* will appear between B agreement and S agreement when the S morpheme is consonant-initial, but will appear after S agreement when the S morpheme is vowel-initial. Further, since L agreement always begins with a consonant (the L morpheme), -*wa* will never move past it. Again referring back to Table 4, the same opacity as in the earlier characterization arises: when the S morpheme is 2F.SG, it is consonant-initial on the surface. For this characterization to work, then, it must still be based off of the underlying forms of the agreement morphemes. It's important to note that a more generally-stated constraint on -*wa* that says its placement should minimize hiatus violations (while still not breaking up any morphemes) is not tenable, since in the 2nd person feminine and plural, there will always be at least one hiatus violation, no matter whether -*wa* moves to precede or follow the S morpheme. (See §5.3.1 for a demonstration of this in OT.)[21,22]

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[21]A promising but ultimately untenable (morpho-)phonological account of -*wa*'s placement is one that assimilates -*wa* more fully to traditional infixes. Indeed, this is the analysis I offered in Kalin (2019a). The relevant observation is that, looking just at Table 4, it appears as though -*wa* uniformly surfaces at the first syllable boundary after the verb base, i.e., after the last syllable that contains root segments. Take, for example, 1st person masculine singular *ga.ḥək.no*, which in the past is *ga.ḥək.way.no*—*k* is the final segment of the root, and there is a syllable boundary immediately following it, and so this is where -*wa* appears; 2nd feminine singular *ga.ḥi.kat* in the past is *ga.ḥi.kat.wa*; 3rd plural *ga.ḥi.ki* in the past is *ga.ḥi.ki.wa*; and so on. Perhaps, then, -*wa* simply subcategorizes for (following) a syllable.

There are three obstacles for this analysis that led me to ultimately abandon it. The first is that syllabification, a phonological process, would have to apply before any other phonological processes, as well as before the insertion and displacement of -*wa*, raising nontrivial questions about the relative timing of morphological and phonological operations. Second, even if we grant that syllabification is the one phonological process that can happen in the course of the morphological derivation, the item that needs syllabifying (in order to get the syllable boundaries in the right place) is the whole verbal complex without -*wa*; this is a problem since in order for the infixal analysis to work, -*wa* must (still) originate in the middle of the verbal complex (as in §4.3.1), and so there is no morphosyntactic consituent containing just the verb without -*wa*. Third, even granting this mysterious syllabification procedure, the L agreement marker needs to be systematically ignored by it, since -*wa* never appears after the L morpheme. As an example of the problem, we can see that starting from the verb form from (31b), *nəš.qol.xu*, 'she kisses you (pl)', we would expect the past form of this to be *nəš.qol.wa.xu*; but in fact the past form is *nəš.qo.wal.xu*—in other words, -*wa* has the same position it would have had if the L agreement marker were absent altogether.

I leave it as an open question for future research whether this syllable-based analysis can be salvaged.

[22]I want to address three other logical possibilities here. (Note that I don't consider any possibilities where -*wa* is a morphosyntactic intervener in the agreement complex, since such an account will not be able to capture the allomorphy facts.) The first possibility takes (57) to be the morphosyntactic starting point, but -*wa* stays put while the B and S morphemes are mobile. Such an account would hold that the B morpheme always moves to precede -*wa*, while the S morpheme moves to precede -*wa* only in the 2nd person. The next two possibilities have a different morphosyntactic starting point, where -*wa* is *final* in the verbal complex, as schematized in (i), either because it is the most embedded morpheme, or because it is right-adjoined to some larger constituent (e.g., the agreement series).

A final note here is that it is quite natural that -*wa* should displace into the agreement complex, rather than into the verb base, since it is the agreement complex and not V that constitutes the morphological constituent that T (first) combines with (as will be illustrated in the derivations in §4.4). This can be taken as another piece of support for the non-canonical verb structure argued for in §3.3.

4.3.4 Exponent choice for past tense: -*wa* inserted before its displacement

So far, I have established the following derivational ordering: (i) exponents are chosen for the agreement morphemes, then (ii) past tense displaces to its surface position, and finally (iii) a cycle of general phonological processes applies to the verb. The last core timing question is about exponent choice for the past tense morpheme itself, namely, whether the exponent is chosen before or after displacement. The data at hand do not adjudicate among these two possibilities, and none of the core conclusions of this work hinge on this.

In order to give an answer to this final question, I turn to the findings of Kalin 2019b, where I investigate interactions between infixation and allomorphy in 29 languages. One core finding is that infixes never have suppletive forms that are conditioned by their surface (infixed) position, though infixes may show minor phonological variation conditioned in this position. What this implies is that exponent choice for an infix precedes its displacement/infixation. I therefore assume that in Turoyo, too, exponent choice for a phonologically-displaced morpheme precedes this displacement. Note that this runs counter to Yu (2007), who takes displacement and exponent choice to be simultaneous (infixation is "direct").

A consequence of past tense being exponed prior to its displacement is that the -*wa*/-*way* alternation must not be a suppletive alternation, but rather one that results from a

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(i)   Verb-B-S-L-*wa*

With (i) as the underlying structure/order, it could then be that -*wa* is mobile, and moves to a position directly preceding the L agreement marker in the general case, and to a further position preceding S agreement when the S morpheme is 1st person. Or, it could be that -*wa* is stationary while L and S agreement are mobile. Such an account would hold that L agreement moves to follow -*wa* in all cases, and additionally, S agreement moves to follow -*wa* when it is 1st person.

I take these alternative analyses to be dispreferred for a number of reasons. If it is the agreement morphemes that are mobile, rather than -*wa*, then this requires the movement of morphemes that are otherwise stationary (as far as I can tell), and also involves the differentially conditioned movement of *two* morphemes, rather than just one. The accounts that take -*wa* to be last in the verbal complex, (i), have to contend with -*wa* inverting with a single L agreement marker if there is one, or two if there are two (in the Verb-L-L constructions of §3.1.2). But perhaps most importantly, there is no longer any straightforward way, in any of these alternative accounts, to state the movement conditions on the mobile morpheme(s) without referring to specific morphosyntactic features, in particular, 1st/2nd person and past tense; no (morpho-)phonological generalization is possible, making it unclear why -*wa*'s displacement should not *precede* exponent choice.

Even if there turned out to be evidence for one of these alternative accounts, the timing of these movements would have to be the same as in the proposed account, namely, after exponent choice for B, S, and L agreement, and before phonology. The same is true of a template-based account that says that -*wa* simply moves to a fixed position in the verbal template, which varies based on the person features of the S morpheme. And so while I think that the current proposal is more straightforward and better supported than the alternatives, none of these alternatives would actually challenge the core conclusions of this work.
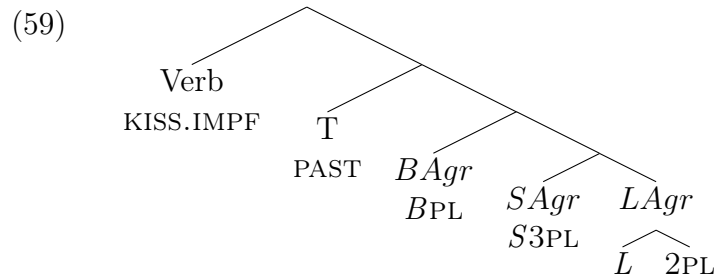
(morpho-)phonological process. Thus, there is only one exponent for past tense, -*wa*, and this is inserted prior to displacement. In its surface position, a glide appears after -*wa*, in a CV environment, thereby closing the syllable that -*wa* is in. I leave it as an open question as to why this process takes place.

4.4   Sample derivations

Let's go through two example derivations to see how the above proposal accounts for the facts. The first example runs through the verbal complex in (58), which has both BPL allomorphy and L allomorphy, alongside the surface-intervening past tense morpheme.

(58) nəšq   -ən -∅ -wa -n-xu   (=nəšqənwanxu)
      kiss.IMPF -***B***PL -***S***3 -PAST -***L***-2PL
      'they used to kiss you (pl.)' (p. 134)

First, the morphosyntax assembles the abstract morphemes that are involved, (59). (See §3.3 and §4.2.1.)

(59)

Verb
KISS.IMPF   T
          PAST *B*Agr
                *B*PL   *S*Agr   *L*Agr
                        *S*3PL   *L*   2PL

Next, exponent choice proceeds from the most deeply embedded node up (Carstairs 1987, Bobaljik 2000, Carstairs-McCarthy 2001, Adger et al. 2003, Embick 2010, *i.a.*), with phonology applying at the very end. This is schematized in (60), starting with the first choice of exponent, which I take to be the personal suffix component of the L agreement marker, consistent with the L morpheme having the function of a sort of preposition/case morpheme. Throughout the derivation, I keep track of the resulting surface string in the rightmost column. (The relative order of (60f) and (60g) is not relevant here.)

(60) a.   2PL → -*xu*   = *xu*
      b.   L → *n* / PL__C   = *n-xu*
      c.   S3PL → -∅   = *n-xu*
      d.   BPL → -*ən* / __CC   = *ən-n-xu*
      e.   PAST → -*wa*   = *wa-ən-n-xu*
      f.   Displacement of PAST   = *ən-wa-n-xu*
      g.   KISS.IMPF → *nəšq*   = *nəšq-ən-wa-n-xu*
      h.   Phonology (no processes apply)   = *nəšqənwanxu*

35

Since past tense is morphosyntactically outside of all the environments for allomorphy discussed in §3, it does not interrupt exponent choice for B, S, and L agreement. The last step involves the verb word being sent to the phonology, but because of its late application (after the displacement of -*wa*), no phonological processes apply, cf. the form in (60d,e), which would have undergone SHORTENING.

Now let's see how the current proposal accounts for -*wa* feeding/bleeding phonological processes, using the example in (61), in which -*wa*'s placement bleeds C-FILLING and SHORTENING (see (51)), and feeds the appearance of default *l* (see discussion around (31)).

(61)   zəbṭ   -∅   -ət   -wa   -C-Ce   (=zəbṭətwalle)
       catch.IMPF -***B***M.SG -***S***2SG -PST -***L***-3PL
       'you (masc. sg.) used to catch them' (J93:135)

The morphosyntax assembles (62).

(62)
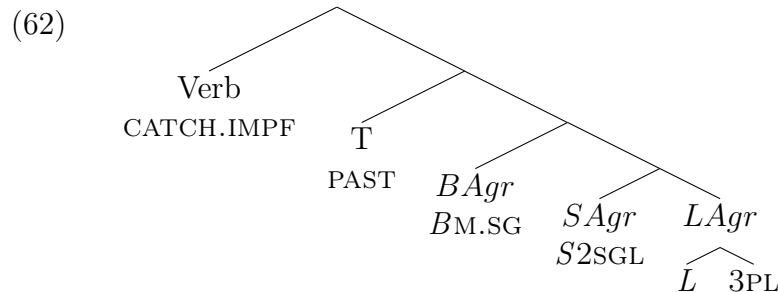
Exponent choice through phonology is shown step-wise in (63).

(63)   a.   3PL → -*Ce*   = *Ce*
       b.   L → *C* / __C   = *C-Ce*
       c.   S2SG → -*ət*   = *ət-C-Ce*
       d.   BM.SG → ∅   = *ət-C-Ce*
       e.   PAST → -*wa*   = *wa-ət-C-Ce*
       f.   Displacement of PAST   = *ət-wa-C-Ce*
       g.   CATCH.IMPF → *zəbṭ*   = *zəbṭ-ət-wa-C-Ce*
       h.   Phonology (*C* filled by *l*; §3.1.3)   = *zəbṭətwalle*

It is clear from (63) that there must not be any earlier phonological cycle prior to the displacement of -*wa*; if there were an earlier phonological cycle, both C-FILLING and SHORTENING would have applied, cf. the form in (63c–e).

4.5   Interim summary

I have shown that the past tense morpheme -*wa* has a variable surface position, and that in this surface position, it is visible to phonology but invisible to exponent choice—both BPL and L allomorphy take place *over* the past tense morpheme; this is especially surprising for

phonologically-conditioned Bpl allomorphy. To understand this data, I proposed that -*wa* is phonologically displaced, like an infix is. This proposal along with a cyclic model of exponent choice and a late phonological computation naturally derives the differentiating behavior of -*wa*: B, S, and L agreement are all exponed before -*wa* takes its surface position, and only after the verb word is exponed is the whole form considered for phonological well-formedness. Most importantly, this data shows that morphology (exponent choice) must properly precede phonology.

5 Against computing morphology alongside phonology

In this section, I take a closer look at what a formal account that evaluates morphology (in particular, exponent choice) alongside phonology would look like for Turoyo. I lay out the basic premise of such accounts with simple examples in §5.1. What we will see in §5.2 is that a P»M account fails for the basic facts of L allomorphy from §3, while the M»P account succeeds with the basic data, but fails in the face of the past tense data in §4, as shown in §5.3.

5.1 Morphology with phonology: Background

Optimality Theory (Prince and Smolensky 1993) is a theory of phonology that pits different phonological realizations of a single input ("candidates") against each other, with the winning realization (the most optimal candidate) chosen by a series of ranked constraints. There are constraints that guard against deviation from the input ("faithfulness" constraints, e.g., Max, which penalizes deletion, and Dep, which penalizes insertion), and those that guard against non-optimal phonological structures ("markedness" constraints). The winning candidate can deviate from the input (violate faithfulness) just in case (i) this deviation improves a non-optimal phonological structure (avoids a violation of a markedness constraint), and (ii) the relevant markedness constraint is ranked above the relevant faithfulness constraint.

There is a long tradition in OT (and approaches closely related to OT) of doing some or all allomorph selection alongside (within) the phonological competition (McCarthy and Prince 1993a,b, Mester 1994, Kager 1996, Mascaró 1996, Booij 1998, Hyman and Inkelas 1997, Horwood 2002, Bonet et al. 2007, Mascaró 2007, Wolf 2008, Kim 2010, *i.a.*). Under these sorts of accounts, the input may be underspecified in certain respects, with the competition weighing (among other things) the outcome of choosing different allomorphs for a particular morpheme in the input. Mascaró (1996), for example, models the selection of *h* vs. *u* for the form of the 3rd person masculine singular clitic in Moroccan Arabic as being a result of purely phonological considerations. (64)–(65) show the competitions deriving *xt*ˤ*ah* 'his error' and *ktabu* 'his book', respectively. The relevant constraints are two markedness constraints, Onset (≈ "have an onset") and No-Coda (≈ "don't have a coda"). (Only non-shared violations of Onset and No-Coda are shown.)

(64)

/xtˤa-{h, u}/	MAX ⦙ DEP	ONSET	NO-CODA
a. ☞ xtˤa-h	⦙		*
b. xtˤa.-u	⦙	*!	

(65)

/ktab-{h, u}/	MAX ⦙ DEP	ONSET	NO-CODA
a. ktab-h	⦙		*!
b. ☞ kta.b-u	⦙		

In (64), *-h* wins as the optimal allomorph, because it avoids creating an onsetless syllable. In (65), *-u* wins, because it allows every syllable to have an onset and lack a coda.

For some instances of allomorphy, morphological constraints are needed alongside phonological ones, as phonological considerations do not arbitrate conclusively among the allomorphs. Kager (1996), for example, models allomorphy of the genitive suffix in Djabugay (*-ŋun* vs. *-n*) by establishing a morphological constraint, GENITIVE=/-n/ (≈ "realize the genitive suffix as *-n*"), which essentially sets up *-n* as the preferred (elsewhere) allomorph in cases where phonological constraints are indeterminate. GENITIVE=/-n/ is dominated by the markedness constraint *COMPLEX (≈ "don't have complex syllable margins"). (66) shows the derivation for the genitive form of *gaŋal* 'goanna', and (67) for that of *guludu* 'dove'.

(66)

/gaŋal, Genitive/	*COMPLEX	GENITIVE=/-n/
a. ☞ ga.ŋal.-ŋun		*
b. ga.ŋal-n	*!	

(67)

/guludu, Genitive/	*COMPLEX	GENITIVE=/-n/
a. gu.lu.du.-ŋun		*!
b. ☞ gu.lu.du-n		

The optimal allomorph in (66) is *-ŋun*, even though it is not the preferred *-n*, because it avoids a complex margin. In (67), the elsewhere emerges because neither allomorph creates a complex margin. This is an example of a "P»M" account of allomorphy, because the pattern is driven by a morphological constraint being dominated by a phonological one.

The above cases involve allomorphy that is to some extent phonologically-optimizing. In cases where allomorph-selection is neutral with respect to optimization (i.e., the allomorphs make the phonological form neither better nor worse), low-ranked morphological constraints can serve to select the winner, just as in (66)–(67). In cases of anti-optimizing allomorphy, morphological constraints need to *dominate* the phonological ones ("M»P"), such that it's

more important to satisfy the morphological constraints than the phonological ones. For example, if Genitive=/-n/ were ranked above *Complex in Djabugay, then -*n* would always be the chosen allomorph, regardless of violations of *Complex, and so a potentially less-optimal candidate (from a purely phonological perspective) could win.

5.2   Against P»M

Is a P»M analysis possible for Turoyo? This section will introduce the basic phonological constraint ranking for Turoyo, motivated by relevant phonological processes from §2.2, and show that L allomorphy is amenable to neither a purely phonological account (along the lines of Mascaró 1996, 2007), nor an account with low-ranked M constraints (along the lines of Kager 1996). To model L allomorphy in OT, an M»P ranking is required, but even this will not be sufficient to account for all the data.

Let's establish some constraints to capture the relevant basic phonological facts in §2.2. First, vowel hiatus is not tolerated in Turoyo, so the markedness constraint *Hiatus (≈ "don't have vowels in hiatus") is undominated. Vowel hiatus is resolved by deletion of one of the offending vowels, telling us that *Hiatus dominates the faithfulness constraint Max-V (≈ "don't delete a vowel").

Next, Turoyo disallows some consonant configurations, e.g., long consonants at word edges, certain CC and all CCC clusters at word edges, and certain CCC clusters word-internally, including clusters with a long consonant. I will use the markedness constraint *CCC (≈ "don't have non-syllabifiable consonant configurations") to cover all such cases; *CCC is undominated. Such consonant configurations are resolved either by shortening (when a long consonant is involved) or ə-epenthesis (for all other configurations). This tells us that *CCC dominates Dep (≈ "don't insert any segments"), which in turn dominates Max-Length (≈ "don't shorten any segment")—the result is a preference for shortening, when possible, and epenthesis otherwise. Finally, Max-C (≈ "don't delete a consonant") is undominated, as simply deleting a consonant from a cluster is never an allowable repair in Turoyo.

The tableau in (68) demonstrates this latter set of basic phonological constraints at work for the example from (4a), where *šarr* 'fight' is realized as *šar*.

(68)

/šarr/		*CCC	Max-C	Dep	Max-Length
a.	šarr	*!			
b. ☞	šar				*
c.	šarrə			*!	
d.	šarər			*!	
e.	ša		*!		

Violating Dep is worse than violating Max-Length, and so the candidate with the shortened long consonant wins.

Now consider L allomorphy, §3.1. Recall that there are 3 allomorphs of the L morpheme, *l*, *n*, and *C*. A P»M account would hold that it is the phonology that selects the appropriate allomorph. Starting with a simple example, (69), repeated from (20a), we know that we need at least one M-constraint, DAT=l (≈ "dative should be realized as *l*"), to account for the elsewhere distribution; there is no phonological constraint that will otherwise prefer *l* to *n* or *C* here.

(69) nəšq   -i   -∅   -l-a   (=nəšqi**l**a / *nəšqi**n**a)
      kiss.IMPF -**B**PL -**S**3 -**L**-3F.SG
      'they kiss her' (J93:133)

The low-ranked M-constraint DAT=l will ensure that, all else being equal, *l* is the optimal realization of the L morpheme.

The example in (70), repeated from (17b), gives us a case of a non-elsewhere allomorph of the L morpheme, *n*.

(70) zəbṭ   -i   -ut   -n-xu   (=zəbṭutənxu)
      catch.IMPF -**B**PL -**S**2PL -**L**-2PL
      'you (pl) catch yourselves' (J93:135)

It is in cases like this that a P»M analysis fails—the cumulative constraint ranking motivated above will not select the correct (attested) form, as shown in (71).[23] A few important notes on interpreting the tableaux that follow: (i) each candidate is annotated with which allomorph of the L morpheme has been chosen; (ii) consistent with this, I assume that faithfulness violations are calculated with respect to the input form *plus* the chosen allomorph; (iii) I omit the complexities of filling C and evaluating multitiered representations here, but such details would be fairly straightforward to implement and would not change my conclusions; (iv) I use ☝ to indicate a winning candidate that does not match the actual attested output form, and ☹ to indicate a losing but attested output form; and (v) I omit considerations of BPL allomorphy in this section for simplicity, but will re-introduce it in §5.3.

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[23]It doesn't matter where MAX-V is ranked, so long as it is not undominated.

(71)

zəbṭ-i-ut-{l,n,C}-xu		*CCC	*HIATUS	MAX-C	DEP	MAX-LENGTH	MAX-V	DAT=1
a.	l: zəbṭiutlxu	*!	*!					
b.	l: zəbṭutlxu	*!					*	
c.	l: zəbṭutxu			*!			*	
d.	l: zəbṭutəlxu				*!		*	
e.	n: zəbṭutnxu	*!					*	*
f. ☹	n: zəbṭutənxu				*!		*	*
g.	C: zəbṭuttxu	*!					*	*
h. 💣	C: zəbṭutxu					*	*	*

The optimal candidate is predicted to be *zəbṭutxu*, derived from choosing the *C* allomorph, because this allows for shortening to repair *CCC; as established above, shortening (a violation of MAX-LENGTH) is preferable to epenthesis (a violation of DEP). But, this is the wrong prediction—it should in fact be the candidate with the *n* allomorph and epenthesis that wins.

In order to make the attested candidate the most optimal one, we need a morphological constraint targeting *n*: DAT=n/PL_C (≈ "dative should be realized as *n* when following a plural feature and preceding a consonant"). This M constraint must be ranked above DEP, thereby creating an M»P constraint ranking. With this additional constraint, the competition successfully picks out the attested output, (72).

(72)

zəbṭ-i-ut-{l,n,C}-xu		DAT=n/PL_C	*CCC	*HIATUS	MAX-C	DEP	MAX-LENGTH	MAX-V	DAT=1
a.	l: zəbṭiutlxu	*!	*!	*!					
b.	l: zəbṭutlxu	*!	*!					*	
c.	l: zəbṭutxu	*!			*!			*	
d.	l: zəbṭutəlxu	*!				*		*	
e.	n: zəbṭutnxu		*!					*	*
f. ☞	n: zəbṭutənxu					*		*	*
g.	C: zəbṭuttxu	*!	*!					*	*
h.	C: zəbṭutxu	*!					*	*	*

The high-ranked M constraint overrules all phonological considerations, such that the anti-optimizing attested output is the winner, rather than the candidate that would win on purely phonological grounds.

What this section has shown is that a P»M analysis is not able to account for L allomorphy, (71), but an M»P account, (72), can. Though not demonstrated above, the rest of the allomorphy facts from §3 (the *C* allomorph of the L morpheme, as well as allomorphy of the plural B morpheme) are also amenable to M»P treatment along the same lines as the *n* allomorph of the L morpheme. Thus far, then, it looks like an account where morphology (exponent choice) is determined alongside phonology *is* possible, so long as certain morphological constraints dominate phonological ones.

5.3   Against M»P

The previous section demonstrated that an M»P analysis (but not P»M) can be constructed for the basic allomorphy data in Turoyo from §3. However, this section will show that once the data involving past tense *-wa* is introduced, §4, an M»P analysis fails. Rather, morphology (exponent choice) must properly precede phonology. I begin in §5.3.1 by showing that there is no straightforward way to determine *wa*'s position alongside the phonological computation, and then turn to attempted derivations of the attested interactions between allomorphy and *-wa*, §5.3.2.

5.3.1   Positioning *-wa*

Recall from §4.3.3 that *-wa*'s positioning is opaque and non-optimizing: its placement must be calculated with respect to the underlying forms of the surrounding morphemes, and does not phonologically improve the output. This section demonstrates why this is problematic for modeling in OT, and ends by stipulating a constraint, ALIGN-*wa*, for use in later tableaux to regulate *-wa*'s position by brute force.

There is a long tradition in OT (and related frameworks) of regulating the placement of infixes and other phonologically-displaced morphemes in the phonology, either through Align constraints or through allowing phonological considerations to determine an affix's placement (see, e.g., McCarthy and Prince 1993a, Hyman and Inkelas 1997, Horwood 2002, Wolf 2008). Such accounts are in the same vein as P»M accounts of allomorph selection. Applying this idea to Turoyo, a tempting analysis of *-wa* is to take its displacement to result from hiatus avoidance, given that it inverts with any adjacent vowel-initial morpheme.

Let's consider what constraints could be marshaled to implement the intuition that *-wa*'s placement is hiatus avoidance: (i) M-CONTIGUITY (≈ "don't break up morphemes"), which must be undominated, because *-wa* never breaks up a morpheme; (ii) an indexed linearity constraint, LINEARITY(*wa*) (≈ "the morpheme *-wa* (PAST) should appear in its underlying linear position"), crucially ranked below MAX-V so that moving *-wa* is preferable to deleting a vowel; and (iii) an undominated general LINEARITY constraint, not shown in the tableaux below, to ensure other morphemes don't move around. The interactions of these new constraints with *HIATUS and MAX-V will drive the "movement" of *wa*.

The account laid out above succeeds for some of the data, namely, when only *one* of the B or S morphemes is vowel-initial, but not when both are. Thus, this analysis is successful in predicting (from Table 4) 'you (m. sg.) laughed' (surface *gaḥikətwa*), as shown in (73).

(I assume the same morphosyntactic structure as motivated in §3.3 and §4.3.1, with tense originating between agreement and the verb base. Note that -*wa* is bolded to make it easier to parse the candidates. Violations of Linearity(*wa*) are assessed relative to the number of segments it is away from its input position. I put aside the constraints that determine which vowel in a hiatus configuration is deleted.)

(73)

gaḥik-**wa**-∅-ət	*Hiatus	M-Contiguity	Max-V	Linearity(*wa*)
a. gaḥik**wa**ət	*!			
b. gaḥik**wa**t			*!	
c. gaḥikə**wa**t		*!		*
d. ☞ gaḥikət**wa**				**
e. gaḥi**wa**kət		*!		*
f. **wa**gaḥikət				***!**

In order to not create hiatus, -*wa* must displace from its underlying position. Since this displacement cannot break up a morpheme, -*wa* moves to the closest morpheme boundary where it will not create hiatus, which in this case is after the S morpheme, -*ət*. Movement into/past the verb base is blocked by the number of violations of Linearity(*wa*) this would incur in order to also satisfy M-Contiguity.

However, this same constraint ranking does not predict the attested output candidate for 'you (f. sg.) laughed' (surface *gaḥikatwa*; see Table 4) as shown in (74). (I put aside the constraints that regulate Lowering.)

43

(74)

	gaḥik-**wa**-o-ət	*HIATUS	M-CONTIGUITY	MAX-V	LINEARITY(wa)
a.	gaḥik**wa**oət	*!*			
b.	gaḥik**wa**ot	*!		*	
c.	gaḥik**wa**t			**!	
d.	gaḥiko**wa**ət	*!			*
e. ☀	gaḥiko**wa**t			*	*
f.	gaḥikoə**wa**t	*!	*!		**
g.	gaḥikoət**wa**	*!			***
h. ☹	gaḥikat**wa**			*	**!
i.	**wa**gaḥikat			*	**!***

The attested output is harmonically bounded, because -*wa* could move less far from its underlying position while incurring only one MAX-V violation to resolve the (inevitable) hiatus. Thus an optimizing account of -*wa* placement in terms of hiatus-avoidance fails.

What is needed is an M»P account of -*wa* placement where a high-ranked M-constraint regulates -*wa*'s position. To implement this, we could consider an (albeit unconventional) Align constraint (McCarthy and Prince 1993a) that implements one of the proposed accounts in §4.3.3, ALIGN(-*wa*,R,¬V,L) (≈ "Align the right edge of -*wa* with the left edge of anything but a vowel").

(75)

	gaḥik-**wa**-o-ət	ALIGN(-wa,R,¬V,L)	*HIATUS	M-CONTIGUITY	MAX-V	LINEARITY(wa)
a.	gaḥik**wa**oət	*!	*!*			
b.	gaḥik**wa**ot	*!	*!		*	
c.	gaḥik**wa**t				**!	
d.	gaḥiko**wa**ət	*!	*!			*
e. ☀	gaḥiko**wa**t				*	*
f.	gaḥikoə**wa**t		*!	*!		**
g.	gaḥikoət**wa**		*!			***
h. ☹	gaḥikat**wa**				*	**!

The constraint set in (75) fails to choose the attested output. In order to get the attested output, the Align constraint would need to be evaluated based on the *underlying* forms

of the agreement morphemes; Align cannot be implemented/evaluated alongside the other phonological constraints.

As an alternative to the Align constraint in (75), one could propose two Align constraints with morphological pivots that are in competition, and that jointly determine -*wa*'s position: Align(-*wa*,R,S.1,L) ($\approx$ "Align the right edge of -*wa* with the left edge of a 1st person S morpheme"), and Align(-*wa*,L,S,R) ($\approx$ "Align the left edge of -*wa* with the right edge of an S morpheme"). So long as the more specific Align constraint is undominated, and the more general one isn't, -*wa* will appear before the S morpheme when it is 1st person, after the S morpheme when it is 2nd or 3rd person, and in situ otherwise (i.e., when there is no B nor S agreement at all). One disadvantage of this, of course, is that person features need to survive into the phonological computation. Another disadvantage is that the phonology needs to be able to see the null 3rd person S morpheme in order to get the alignment right.

In order to be able to move forward with pursuing an M»P account of the Turoyo data in the face of the opacity of *wa*-placement, I will assume that some account of -*wa*'s placement can be constructed that is determinable in the phonology. In the service of this, I will simply utilize an underspecified constraint Align-*wa* in all further tableaux, which will penalize any candidate where -*wa* is not linearly aligned in the desired attested position. As an illustration, here is this constraint in action:

(76)

	gaḥik-**wa**-o-ət	ALIGN-*wa*	*HIATUS	M-CONTIGUITY	MAX-V	LINEARITY(*wa*)
a.	gaḥik**wa**oət	*!	*!*			
b.	gaḥik**wa**ot	*!	*!		*	
c.	gaḥik**wa**t	*!			**	
d.	gaḥiko**wa**ət	*!	*!			*
e.	gaḥiko**wa**t	*!			*	*
f.	gaḥikoə**wa**t	*!	*!	*!		**
g.	gaḥikoət**wa**		*!			***
h. ☞	gaḥikat**wa**				*	**

This constraint is, of course, a brute-force instrument; the reader should keep in mind that we have *not* solved the opacity problem of -*wa*'s placement (in a way that is compatible with a parallel OT model). Going forward, I will omit M-CONTIGUITY and LINEARITY(*wa*) from the tableaux, as they no longer play any role in regulating -*wa*'s placement.

5.3.2 Interactions between -*wa* and allomorphy

The previous section settled on the stipulated constraint Align-*wa* to regulate -*wa*'s surface placement. The next step in being able to (attempt to) model the interaction of -*wa* with allomorphy is to supplement the constraints established in §5.2 with those needed to regulate B allomorphy. In particular, we need two constraints, B.PL=i (≈ "the plural B morpheme should be realized as *i*") and B.PL=ən/__CC (≈ "the plural B morpheme should be realized as *ən* when preceding two consonants"). The constraint B.PL=i can be low ranked, as it simply establishes the elsewhere. But the constraint B.PL=ən/__CC is a phonologically anti-optimizing M-constraint: satisfying B.PL=ən/__CC will result in phonologically worse candidates, as they will either incur a *CCC violation or (when *CCC is resolved) a Max-Length violation; choosing the elsewhere allomorph of the plural B morpheme (-*i*) would avoid both. Thus, B.PL=ən/__CC must be highly ranked. (The -*ən* allomorph also introduces a coda where otherwise there would not be one, another markedness violation that is not shown in the tableaux here.)

Putting everything above together, we can see in (78) that having one competition—where all allomorphs are selected and -*wa* simultaneously finds its displaced surface position—fails.[24] The test case is the same as from the first derivation in §4.4, (58), repeated in (77), featuring both the *n* allomorph of the L morpheme and the -*ən* allomorph of the plural B morpheme. (As a reminder, I assume that faithfulness for a given candidate is calculated with respect to the allomorphs chosen, which are indicated before each candidate.)

(77) nəšq   -ən -∅ -wa -n-xu   (=nəšqənwanxu)
      kiss.IMPF -**B**PL -**S**3 -PAST -**L**-2PL
      'they used to kiss you (pl.)' (p. 134)

(78)

nəšq-**wa**-{i,ən}-∅-{l,n,C}-xu	ALIGN-*wa*	DAT=n/PL__C	B.PL=ən/__CC	*CCC	*HIATUS	MAX-LENGTH	MAX-V	DAT=l	B.PL=i
a. i,l: nəšq**wa**ilxu	*!	*	*		*				
b. 💣 i,l: nəšqi**wa**lxu									
c. i,n: nəšqi**wa**nxu								*!	
d. ən,l: nəšqən**wa**lxu									*!
e. ☹ ən,n: nəšqən**wa**nxu								*!	*!

The first candidate, with a non-displaced -*wa* and the elsewhere allomorphs -*i* and *l* violates both high-ranked M constraints (and *Hiatus). But, once -*wa* is displaced to its optimal position, as it is in the rest of the candidates, these M constraints are no longer violated

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[24]In the remainder of this section, I omit Max-C and Dep for space reasons, as they do not play a role in understanding the interactions here.

because the environments for choosing *ən* and *l* are absent (*-wa* disrupts the environment which would require their satisfaction). Thus the predicted winner is the candidate with the elsewhere allomorphs, over the attested output form, which has both conditioned allomorphs.

In a second attempt to derive the attested output, we could split the competition in (78) into two cycles—one for before *-wa* is introduced (in which the allomorphs are selected), and one taking the output of that competition and adding *-wa*.[25]

(79)

nəšq-{i,ən}-∅-{l,n,C}-xu	ALIGN-*wa*	DAT=n/PL___C	B.PL=ən/___CC	*CCC	*HIATUS	MAX-LENGTH	MAX-V	DAT=l	B.PL=i
a. i,l: nəšqilxu		*!	*!						
b. ☹ ən,n: nəšqənnxu				*!				*	*
c. 💣 ən,n: nəšqənxu					*			*	*

Without *-wa* as an intervener, the candidate with the elsewhere allomorphs loses: the high-ranked M constraints favor the conditioned allomorphs, even though choosing these allomorphs results in more violations of low-ranked constraints. (Hence, this is anti-optimizing allomorphy.) This is a step in the right direction, and the winning candidate in (79), *nəšqənxu*, is indeed the attested output form without past tense, as seen in (38b). But, the winner in (79) is crucially not the *desired* output here, because it's not the right input for *-wa* placement. With *nəšqənxu* as the input to *wa*-placement, it is impossible to get the right attested form with *-wa*, *nəšqənwanxu*, since this would require a mysterious re-appearing of the second *n* (which has been deleted in the winning candidate above). The crucial observation here is that, when *-wa* is going to be part of the verbal complex, all phonological processes "wait" until *-wa* takes its surface position, §4.2. So what fails about the two-cycle attempt here is that the full competition (morphology plus phonology) runs both before and after *-wa* is introduced.

Ultimately, in order to get to the attested final output form, what is needed is a first cycle of *just* allomorph selection, crucially without any other phonological constraints/processes, (80).[26]

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[25]I undertake this attempt quite literally, running one cycle without *-wa* and one with it. This attempt would actually fare even worse if I broke down the verb into all of its morphemes and built it up cyclically starting with the L agreement marker (as in §4.4), running a full competition at each step; the reason this would fare worse is because the L morpheme needs to "see" both a less-embedded PL morpheme and the more-embedded personal suffix.

[26]For simplicity, I model this as a sort of simultaneous exponent choice for the whole verbal complex at once. However, given the facts about directionality of phonological-conditioning (it's always inwards, not outwards; see §3.3), I assume that exponent choice actually proceeds incrementally from the most embedded node; this can be accomplished in OT through a new competition for exponent choice at each successive node, or through a model like Wolf's (2008) Optimal Interleaving.

(80)

nəšq-**wa**-{i,ən}-∅-{l,n,C}-xu	DAT=n/PL=C	B.PL=ən/=CC	DAT=l	B.PL=i
a.　　　i,l: nəšq-**wa**-i-l-xu	*!	*!		
b.　　　i,n: nəšq-**wa**-i-n-xu		*!	*	
c.　☞　ən,n: nəšq-**wa**-ən-n-xu			*	*
d.　　　ən,l: nəšq-**wa**-ən-l-xu	*!			*

The output of (80), when fed into a second competition that includes all the rest of the constraints (the constraints for choosing allomorphs are no longer relevant and so are omitted below), will result in the desired winning candidate:

(81)

nəšq-**wa**-ən-n-xu	ALIGN-wa	*CCC	*HIATUS	MAX-C	DEP	MAX-LENGTH	MAX-V
a.　　　nəšq**wa**ənnxu	*!	*!	*!				
b.　　　nəšq**wa**nnxu	*!	*!					*
c.　　　nəšq**wa**nxu	*!					*	*
d.　　　nəšqə**wa**nnxu	*!	*!					
e.　☞　nəšqən**wa**nxu							

Finally, the attested output is the winning candidate in cases where there is both allomorphy and -*wa*. The reason both *n*s survive here is that allomorph choice was done separately from and prior to both -*wa* placement and phonology; -*wa*'s position between the B and S morphemes removes (bleeds) the environment for SHORTENING. This same two-cycle approach—allomorphy before phonology—will capture all of the data in §3 and §4.[27]

5.4　Interim summary

This section showed that an M»P, but not P»M, account can be constructed to model the basic allomorphy data in §3; but even an M»P account does not successfully capture the past tense data in §4. Ultimately, the only successful OT model of the Turoyo data involves first running a cycle that *just* does allomorph choice, and nothing else. In other words, we're forced to separate morphology (exponent choice) from phonology—no ranking of phonological constraints with respect to morphological constraints (P»M or M»P) can achieve the desired outcome.

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[27]One might consider an approach that makes use of output-output faithfulness to account for this data (comparing past forms with non-past forms), without having to separate exponent choice from phonological processes. However, to make such an account work, there would need to be output-output correspondence for *morphological* choices, but crucially not phonological ones, which essentially recreates the morphology-phonology separation.

It is important to note that the Turoyo data are not fundamentally incompatible with an OT model, but rather just of an OT model that simultaneously calculates allomorphy and phonology. There are a number of OT-based models that separate exponent choice from phonological processes, along the lines of the successful final derivation here—see, e.g., Trommer 2001, Dawson 2017, Foley 2017, Rolle 2020. Such accounts are in theory able to capture the data at hand, assuming that a suitable constraint (or set of constraints) can be identified to regulate *wa*-placement.

6   Implications for the morphology-phonology interface

In this paper, I have carefully considered the complex morphophonology of verbs in the Neo-Aramaic language Turoyo. This data argues strongly for a separation of morphology and phonology, in particular with exponent choice fully preceding purely phonological processes. Allomorphy in Turoyo feeds and bleeds phonological processes and can be anti-optimizing and opaque. These results are in line with much earlier work; see especially Paster 2006, 2009. In addition, a variably-placed, infix-like morpheme counterfeeds and counterbleeds allomorphy (even phonologically-conditioned allomorphy), while feeding and bleeding phonological processes. To my knowledge, the latter type of evidence, involving phonologically-conditioned allomorphy, is novel.

The Turoyo data are crucially not compatible with models that compute phonologically-conditioned exponent choice solely in the phonological component. However, there are a number of accounts that hold that *optimizing* phonologically-conditioned allomorphy is handled in the phonology (like the cases in §5.1), but *non-optimizing* phonologically-conditioned allomorphy is handled *before* the phonology (see, e.g., Booij 1998, Bonet et al. 2007, Mascaró 2007, Nevins 2011, Bermudez-Otero 2012, Yu 2017, de Belder 2020). While the Turoyo data are, strictly speaking, compatible with such accounts, there are two reasons to doubt that this type of dual approach is desirable.

As a first way to probe the plausibility of a dual approach to allomorphy, we can ask whether the behavior of phonologically-displaced elements is systematic crosslinguistically—do infixes, in general, pattern like the Turoyo past tense morpheme, in being ignored by allomorphy around the landing site of the infix? The only two other comparable cases that I have found, Cibemba (Hyman 1994) and Palauan (Embick 2010:3.4.3), suggest that this behavior is indeed systematic. In Cibemba, there is a morphologically-triggered phonological alternation of the stem-final consonant, conditioned by the causative suffix, and this alternation persists even when a displaced applicative morpheme linearly intervenes between the stem and the causative morpheme—displacement counterbleeds the morphophonological interaction. In Palauan, a suppletive alternation of the prefixal Verb Marker, conditioned by verb class, persists across a displaced past tense morpheme that linearly intervenes between the verb root and Verb Marker—displacement counterbleeds morphologically-conditioned suppletive allomorphy. I have found no cases where suppletive or morphophonological allomorphy *is* bled (blocked) by a phonologically-displaced element, but a dual approach would predict such cases to exist. Expanding outwards from the narrow type of allomorphy-

infixation interaction at hand in Turoyo, in Kalin (2019b)—discussed already in §4.3.4—I show that when looking at suppletive allomorphy of infixes themselves, the same sort of pattern is observed: exponent choice for the infix must *precede* infixation of the infix, even when phonologically-conditioned. This is again only understandable if exponent choice uniformly precedes phonology.

Finally, I will reiterate several arguments made by Paster (2006:§6.4) against the dual approach. If there were two types of phonologically-conditioned suppletive allomorphy, with some handled in the phonology and some in the morphology, then we would expect there to be two different empirical profiles for non-optimizing and optimizing suppletive allomorphy, where the latter can be output-based, can be conditioned from the outside, and can be non-adjacent to its trigger. However, these patterns of phonologically-conditioned suppletive allomorphy are not observed. There is, in addition, the problem of deciding which types of allomorphy are to be handled in the phonology and which not—the line between optimizing and non-optimizing suppletive allomorphy is blurry. With no principled way to categorize suppletion into optimizing and non-optimizing cases, and no differential behaviors between these supposedly distinct types of suppletive allomorphy, the most parsimonious account is one in which all suppletive allomorphy is computed prior to phonology.

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