Readjustment: Rejected?

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Abstract

Since the establishment of Distributed Morphology (Halle and Marantz 1993), readjustment rules have been a central tenet of the theory. Readjustment is a post-Lexical-insertion phonological operation triggered on certain Vocabulary Item by some aspect of the morphosyntactic context (e.g. a vowel change on a noun Root like *mouse*, triggered either by the [PL] feature of Num^0 or the null affix exponent inserted to express the [PL] feature of Num^0, to yield an output of *mice*). This process-based aspect of a syntacticocentric theory is quite odd, however, given DM's otherwise "piece-based" (Item-and-Arrangement) orientation. Various DM practitioners seem to have adopted readjustment as a necessary evil, even while bringing to the fore its problematic aspects; see, e.g. Harley and Noyer's (2000:133) observation about stem suppletion, that any theory that could allow radical stem readjustments (e.g. deriving *worse* from *bad*) "could presumably do anything"; and Embick and Halle's (2005:60) *piece assumption* (where, "all other things being equal, a piece-based analysis is preferred to a Readjustment Rule analysis when the morpho-syntactic decomposition justifies a piece-based treatment"). Some recent work in DM (see, e.g., Siddiqi 2006, 2009; Bermúdez-Otero 2012; Bye & Svenonius 2012; Haugen and Siddiqi 2013; Kilbourn-Ceron et al. *this volume*, etc.) has called into question the necessity of readjustment rules, and a variety of different approaches can perhaps indeed obviate them. The purpose of the present paper is to raise the metatheoretical question of whether or not readjustment (i.e. the alteration of stem phonology after lexical insertion) is needed for *any* morphological theory. The conceptual and empirical domains investigated here include: (i) the employment of readjustment rules as "secondary exponence" phenomena; (ii) verb stem allomorphy in the Uto-Aztecan languages Hiaki (Yaqui) and Classical Nahuatl; and (iii) verb stem allomorphy concurrent with reduplication in the Oceanic language Sye (Erromangan). The most cogent argument in favor of readjustment rules over stem-listing approaches invokes the frequent phonological regularity of stem alternants (e.g., Harley and Tubino Blanco's 2013 analysis of stem form alternations Hiaki). I adopt an alternative analysis whereby such regularities can be just as felicitously explained by appealing to historical linguistic processes rather than to readjustment rules applying in the synchronic grammar. This discussion thus falls under the purview of what Kiparsky (2006) has described as an "amphichronic program for linguistic theory".

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1. Introduction

The *readjustment rule*, i.e. the morphologically-induced alteration of stem or affix phonology after lexical insertion, was established as a standard "process-based" mechanism at the outset of the development of Distributed Morphology (DM), an otherwise mostly "piece-based" ("item and arrangement") morphological theory introduced by Halle and Marantz (1993) which has spawned much subsequent literature over the past two decades. This mechanism has come under fire from proponents of DM in the past few years, however, and recent versions of the theory have been proposed to obviate their use. While some current discussions within DM theorizing remain agnostic as to whether readjustment rules ought to stay or go, few proponents have actively argued that any empirical evidence or conceptual considerations actually necessitate their use. The purpose of this paper is to review the controversy surrounding readjustment rules in DM and to analyze arguments which have been proposed in their favor.

There are three domains, involving both conceptual and empirical issues, at play in the current investigation. The first is the issue of employing readjustment rules as "secondary exponence" phenomena (cf. Raimy 1999). Second, we consider Harley and Tubino Blanco's (2013) arguments for readjustment rules over a stem-listing (suppletion) account of verb stem allomorphy in the Uto-Aztecan language Hiaki. The primary novel empirical contribution of the present paper will be to bring related data to bear from a related Uto-Aztecan language, Classical Nahuatl, which I argue provide more complexity than is found in Hiaki, which in turn calls into question the elegance of a readjustment rule analysis for the relevant data. Finally, we consider

verb stem allomorphy co-occurring with the morphological process of reduplication in the Oceanic language Sye (Erromangan), which Frampton (2009) argues provides strong evidence for clear synchronic readjustment rules to create derived verb stems.

I will conclude that previous arguments have yet to make a convincing case in the affirmative for readjustment rules and that, until such can be made, this mechanism ought to be rejected from the theory, as has been repeatedly called for in recent DM work. While much of my discussion will be clearly focused within the framework of DM and my analyses are couched within that theory, I also suggest that the metatheoretical upshot of this discussion is that "readjustment operations", in the narrow sense to be clarified below, ought to be questioned as a necessity for *any* theory of morphology. In this I will support Bermúdez-Otero (2012)'s strong *Morph Integrity Hypothesis* (viz. that "the representational currency of morphology is the morph: morphology is not allowed to operate directly on elements of phonological representation such as features, segments, nodes, or association lines", p.44).

This paper is structured as follows. In section 2 I present an overview of the issue of readjustment rules in DM, which were introduced into the theory when it was first proposed by Halle and Marantz (1993) but which date back as far as Chomsky and Halle's (1968) *The Sound Pattern of English* (*SPE*). This mechanism, imported from pre-DM but post-*SPE* work such as Halle (1990), became a standard mechanism within the theory, but it was viewed by critics as highly problematic at the outset. As noted above, recent practitioners from within the DM tradition have also come to the conclusion that readjustment rules are problematic, on both empirical and conceptual grounds, and recent versions of the theory have been proposed which omit them. Use of readjustment rules remains an ongoing controversy within DM theorizing, so it is very well to re-visit the arguments that have been propounded in its favor. To this end, in

section 3 I re-visit several works within the DM framework which make crucial use of readjustment rules, to evaluate to what extent such rules may actually be necessary. These works include: Raimy (1999), who implements a clear implementation of readjustment rules as secondary exponence in his development of the first major DM-based theory of reduplication (§3.1); Harley and Tubino Blanco (2013), who discuss the merits of the readjustment rule analysis, over a stem-listing (suppletion)-based analysis, of verb stem allomorphy displayed in Hiaki (§3.2); and Frampton (2009), who argues for the empirical necessity of readjustment rules within an *SPE*-style derivational phonology framework because of the interactions of stem readjustment with reduplication in the Oceanic language Sye (Erromangan) (§3.3). I will provide critical discussion of each of those cases and conclude that none rise to the challenge of making readjustment rules an empirical necessity.

The most cogent argument in favor of readjustment rules over stem-listing approaches invokes the phonological regularity of stem alternants (see, e.g., Harley and Tubino Blanco's 2013 analysis of stem form alternations Hiaki). In sections 3.2 and 3.3, however, I suggest an alternative view. By adopting Kiparsky's (2006) *amphichronic program for linguistic theory*, I argue that such regularities can be better explained by historical linguistic processes and diachrony rather than appealing to readjustment rules applying in the synchronic grammar. Section 4 then concludes with a metatheoretical discussion beyond these DM-specific arguments, challenging the notion of readjustment rules (in the sense of morphologically-induced phonological operations occurring on stems and/or affixes after lexical insertion) for any theory of morphology.

2. A Quick Overview of Readjustment Rules in DM and Beyond

Readjustment rules are one of two types of morphological operation which traditional DM (i.e. the theory as introduced by Halle and Marantz 1993 and which forms the basis for many subsequent derivative approaches) makes available to express exponence; the second is Vocabulary insertion. Within the theory, Vocabulary insertion is taken to be the primary means of morphological exponence, with a "Vocabulary item" (VI) being the chunk of phonological material (i.e. what is often called a "morpheme" in other theories) that gets inserted into a syntactic terminal node containing some (set of) morphosyntactic features; this spell-out process occurs after the conclusion of the syntactic derivation (or after the phases produced therein). The Vocabulary insertion operation is subject to principles and constraints such as feature-matching (where a VI with conflicting features is not available for insertion into a particular node) and the elsewhere condition (the notion that the VI matching the most available features contained in a node will be the VI which gets inserted into that node, in preference over less specified VIs). A key component of Vocabulary insertion is that phonological features of VIs are not relevant to, and indeed are not even present in, the syntax proper; this is the principle of *Late Insertion*.[1] Vocabulary insertion discharges morphosyntactic features, and Halle and Marantz (1993) found it crucial to point out that the VI insertion process at Morphological Structure (MS), i.e. the interface component mediating the syntactic and phonological components, "is subject to the constraint that it cannot modify already existing feature values" (p.122).

[1] Although Halle and Marantz's original (1993) formulation of DM supposed that Late Insertion applied to all VIs, some more recent work (e.g. Embick and Halle 2005) has taken the weaker position that Late Insertion only applies to "functional" (e.g. inflectional, derivational) morphemes and that "lexical" morphemes (i.e. Roots) are present throughout the syntactic derivation. Haugen and Siddiqi (2013) show that this move is problematic on both empirical and conceptual grounds, and here I assume instead, as was originally proposed by Halle and Marantz (1993), that Late Insertion applies to all VIs.

Readjustment rules, on the other hand, are operations which are invoked specifically to take VIs which have already been inserted into some syntactic terminal node and to alter the phonological feature values of those VIs. In some cases this alteration is taken to be triggered by some affix (e.g. *leave* > *lef-t*, where the regular English past tense suffix is taken to cause readjustment to the stem phonology of certain arbitrarily specified roots, including *leave*, *mean*, *keep*, etc.), but in many cases this alteration actually serves as the de facto primary exponent of a morphological feature or context (or, in the technical implementation, as the secondary exponent of a null affix which is taken to trigger the stem change) (Halle and Marantz 1993: 124-9). A prototypical case of the latter is the vowel ablaut process which marks the plural in a limited subset of English nouns (e.g. *foot* > *feet*, *mouse* > *mice*). In his presentation of a framework which served as a precursor to DM, Halle (1990) gives the following as a formalization of this kind of readjustment rule. The rule takes the output of an instance of Vocabulary insertion (e.g. a noun like *foot* or *mouse*) and (re)adjusts the phonological structure of the relevant VI given some morphological context (in this case, the feature [Plural] co-occurring with a noun Root from a specified list of irregular nouns):

(1) English Plural Ablaut as a Readjustment Rule (adapted from Halle 1990: 157 [10])

$$V \rightarrow \begin{bmatrix} \text{-back} \\ \text{-low} \end{bmatrix} \; / \; [X \_\_ Y] \; + \; \text{Plural} \; / \; \{ \underline{\text{foot}}, \; \underline{\text{mouse}}, \underline{\text{louse}}, \underline{\text{goose}}, \; \underline{\text{tooth}}, \underline{\text{man}}, \underline{\text{woman}}, \ldots . \; \}$$

In a DM-style analysis as presented by Halle and Marantz (1993), such readjustment would be triggered by a null (Ø) affixal exponent of [Plural], which would be the thing triggering readjustment of the stem later in the derivation, in the phonological component.

Thus, canonical DM proposes that all VIs are subject to the process of Vocabulary insertion (given limitations such as feature-matching, the elsewhere condition, etc.), and some special VIs are, in addition, subject to a secondary process of readjustment (given the co-

occurrence of some morphosyntactic feature(s) with the presence of some specific VIs on an arbitrary list). Although imported directly into DM as a standard mechanism from such pre-DM work as Halle (1990), such readjustment rules have a long pedigree going back to *SPE* (Chomsky and Halle 1968). To clarify some of the problematic aspects of readjustment rules it will be of use to review why such rules were introduced into generative grammar in the first place. Further, it will also be worthwhile to revisit some of the pre-DM criticisms that were lodged against them early on, since these largely anticipate DM-internal criticisms that came much later but which tread on much the same ground.

2.1. Where do readjustment rules come from, and what were they supposed to do?

The *SPE* notion of "readjustment rule" was quite broad compared to what would eventually be incorporated into DM. Halle (1990), for example, defines readjustment rules as an additional set of rules (to go along with Vocabulary insertion rules) "that change the composition of morphemes in the terminal string" (p. 156). Halle thus seems to limit the purview of such rules to the morphology (or the output of the morphology). In *SPE*, on the other hand, readjustment rules had a much larger scope of application, being brought into the theory by Chomsky and Halle (1968) to deal with what they regarded as troublesome phenomena creeping perilously close to the domain of "performance" and as such potentially outside the scope of their development of a theory of "competence". In their introduction of readjustment rules in *SPE* Chomsky and Halle were specifically concerned with the mismatch between syntax-generated structures like noun phrases in embedded relative clauses (e.g. *This is [the cat that caught [the rat that stole [the cheese]]]*, where the bracketing indicates the NPs appearing in the predicate) and the non-isomorphic intonational phrases which can be imposed upon such

structures. For example, the intonational breaks in the aforementioned sentence about "the cat" and "the rat" and "the cheese" do not correspond to the NP brackets, but rather involve pauses after *cat* and *rat*. This intonational phrase structure is not obviously connected to the aforementioned bracketed structure for embedded NPs which is presumably what gets generated by the syntactic component. Chomsky and Halle state that, "[i]t seems clear that the grammar must contain readjustment rules that reduce surface structure, but it is very difficult to separate the study of these processes from the theory of performance in any principled way" (p.371), and they conclude that "[o]ur inability to provide a more explicit theory of readjustment rules is in part a consequence of the limitations of our investigation of syntactic determination of phonetic shape" (p.372). While readjustment rules are clearly relevant for morphology in SPE, it is equally clear that such rules fall into the broad domain of "post-syntax" and as such they are as needed for alterations to sentence-building procedures as they are for word-building procedures, at least in Chomsky and Halle's original conceptualization.

Chomsky (1973) continues in this frame of mind by also viewing readjustment rules as generally relevant to post-syntactic operations (not just morphological operations), and he even makes reference to "the readjustment rule component of the grammar", i.e. "that which relates syntax and phonology" (p.254). Likewise, in an effort to actually put some formalization to the readjustment rule notion, and to explore the nature of this supposed "readjustment rule component of the grammar", Langendoen (1975) also focuses on the issue of mismatch between the syntactic structure of embedded phrases and the intonational units holding over them. Langendoen proposes a readjustment rule schema for such structures and hypothesizes that it is not merely a device to explain English-specific mismatches of the type discussed above, but is indeed a property of universal grammar. It should be clear from this discussion that in the earliest

implementations readjustment could impact all outputs of the syntax (including bracket erasure); readjustment was not something that was viewed as focused specifically or even primarily on the outputs of morphology.

2.2. Where do readjustment rules apply?

To put these early usages of readjustment rules into the more contemporary context of DM, let us consider how this supposed "readjustment rule component of the grammar"—the object of interest by Chomsky, Halle, and Langendoen—might fit into the architecture of the grammar within contemporary versions of DM. At first blush it might seem straightforward to accommodate such a notion, given that DM follows the now traditional Y-model of generative grammar (where the syntactic derivation branches off, at the point of Spellout, to two interface components: Phonological Form (PF), associated with the actual phonetic articulation of an utterance, and Logical Form (LF), associated with the meaning of an utterance). In all DM-related theories, the syntax feeds the morphology which subsequently feeds the phonology, so positing a post-syntactic "readjustment rule component" would be consistent with such a theory, and there are a variety of places wherein such a component could be plausibly located. Halle and Marantz (1993) propose that there is a module, MS, between Spellout and PF; this is the domain of morphological operations (fusion, fission, etc.) which precede Vocabulary insertion (which in turn logically precedes the application of readjustment rules). Arregi and Nevins (2012) present a highly structured vision of the morphological component, which they call *Postsyntax*, as a serial and modular component wherein morphological operations occur in a predictable order (e.g. *Linearization* follows *Exponence Conversion*, *Feature Markedness*, and *Morphological Concord* operations, but precedes *Linear Operations*, which in turn precedes *Vocabulary Insertion*).

Under either approach, one could attempt to either identify one of these larger components (i.e. MS or Postsyntax) themselves as that "readjustment rule component of the grammar" identified by Chomsky and Halle, or to argue for a more narrow readjustment rule sub-component which lies within one of these components (e.g. Readjustment Rules as a sub-module of Arregi and Nevins' Postsyntax).[2]

Because different theoretical implementations will vary on the details of where readjustment may or may not take place, I remain agnostic here on the specific instantiation of Chomsky and Halle's "readjustment rule component" in contemporary DM terms. However, I do share with those authors a concern that between the syntax and an actual utterance by a human in some speech context there is a murky area which Chomsky has traditionally relegated to "performance". It may be worth speculating that there could be a "performance component" of the grammar, which would be post-syntax, post-morphology, and even post-phonology. In addition to perhaps accounting for the syntactic bracket erasures preceding intonational phrase marking of the type discussed above, such a component would also be a place to handle phenomena like the use of rising intonation to form questions in English. This is necessary for the syntax for most English speakers (to make a declarative statement interrogative without the usual subject-auxiliary inversion and *do*-support which go along with more prototypical English question formations), but it is also necessary for the morphology more narrowly. The proper

[2] Arregi and Nevins themselves eschew the use of the term *readjustment rule* in favor of *morpheme-specific rule*, but the effect is much the same in many cases. Arregi and Nevins are clear that in their derivational model such rules are a part of the PF component and that these rules can feed and bleed, and be fed and bled by, other rules. Arregi and Nevins' implementation is a slightly different view than what is found in some other approaches, e.g. that of Halle (1990: 157) who explicitly places "readjustment" as a component preceding Phonology and even Spell-out.

I am using the term *readjustment rule* more narrowly here not to refer merely to morpheme-specific phonological rules, as in Arregi and Nevins (2012), or to morpheme-specific constraints, if one buys into Optimality Theory over derivational phonology in the SPE tradition, cf. Kiparsky (forthcoming). Rather, I am referring to readjustment rules as those post-Vocabulary insertion phonological rules which are invoked to alter the phonology of an inserted VI for the primary purpose of accounting for the exponence of some other morphological feature or context (whether concurrent with a null affix or otherwise).

pronunciation of the title for this paper, for example, mandates rising intonation on the post-colon word *rejected*, as indicated by the question mark which indicates that this word is posed in the form of a question rather than as a declarative statement. Other examples of performance phenomena in English can be easily pointed to, e.g. affective use of creaky voice to "sound like Britney Spears" (so-called "vocal fry"—see Liberman 2011), paralinguistic alterations of speech such as whispering and modulation of volume, and so on. These are interesting and important questions which clearly fall beyond the scope of our focus here.

2.3. Why are readjustment rules problematic?

To return to the main issue at hand, i.e. readjustment rules as a mechanism made available to the morphology, alas, it was not to be the fate of such rules, nor the generative phonology rules upon which they were based, to maintain universal high regard or even acceptance in perpetuity. Indeed, by the late 1980s and early 1990s, before DM was ever introduced as such, such rules were already being problematized by some scholars working in the generative tradition.

Pullum and Zwicky (1992), for example, provide trenchant criticism of the importation of readjustment rules to the morphology in the pre-DM framework presented by Halle (1990), which was one of the main sources of readjustment rules for standard DM as introduced by Halle and Marantz (1993). One major conceptual issue for such rules is their unrestricted nature, and, additionally, the fact that they can be ordered in a language-specific ("parochial") fashion infamously leads to an implausibly large number of possible grammars.[3] As Pullum and Zwicky

[3] Zwicky and Pullum (1992) do the math as such: "For a given set of *n* rules, a theory in which principles of rule interaction are universal determines exactly one grammar corresponding to that set of rules, while a theory assuming parochially stipulated linear ordering of rules determines a class of *n!* distinct grammars". Chomsky and Halle (1968) pose 50 rules for English grammar, so, if we assume that those are actually the correct rules for English and

put it, "Halle not only opts for a powerful derivational theory, he also permits parochial stipulations as to the order in which rules apply. From a metatheoretical point of view, this is a decidedly retrograde move" (p.393). They point out that by the late 1970s generative linguists had largely dropped the notion of parochially stipulated linear rule ordering for both syntax as well as phonology. Pullum and Zwicky continue:

> Despite the methodological undesirability of parochial rule ordering, Halle assumes it not only for phonology, but also for morphology, where no arguments for it have been mustered in the literature. This is in contrast to syntax and pre-1977 phonology,[4] where the literature contains well-known (though often flawed) arguments for parochial ordering. (p.394)

To my knowledge, no such arguments ever were presented in the early days of DM which would specifically justify their incorporation as a mechanism within the theory. However, these rules rose to the status of a de facto standard part of the theory by virtue of being used by Halle and Marantz (1993). In subsequent years various DM practitioners seem to have adopted readjustment rules as a necessary evil, even while bringing to the fore their problematic aspects. Consider, for example, Harley and Noyer's (2000) observation about stem suppletion that any theory that could allow radical stem readjustments (e.g. deriving *worse* from *bad*) "could presumably do anything" (p.133); and also Embick and Halle's (2005) *piece assumption*, which dictates that, "all other things being equal, a piece-based analysis is preferred to a Readjustment Rule analysis when the morpho-syntactic decomposition justifies a piece-based treatment" (p.60). Nevertheless, many DM practitioners have presented analyses explicitly using readjustment rules,

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if we assume that rules must be strictly ordered, then "the right actual phonological component would have to be sifted out from among the $50! \approx 3 \cdot 10^{65}$ possible orderings of those rules. (The situation is even worse if partial orderings are allowed...)" (p.393).

[4] In Pullum and Zwicky's discussion, 1977 marks an important year because by then "the notion that syntactic rules were unordered was adopted without remark by MIT linguists (cf. Chomsky & Lasnik 1977, 431)", and contemporary works in phonology, e.g. Liberman and Prince (1977), "began to de-emphasize the issue of rule ordering....moving away from the string manipulations of SPE in favor of more structural and multi-dimensional conceptions of phonology. Efforts at arguing for the necessity of rule ordering in phonology were largely tabled" (p.393).

including recent entries such as Embick (2010) and Arregi and Nevins (2012). Indeed, two DM-based theories which were designed to account for ostensibly process-oriented morphology within the piece-based theory of DM (i.e. the morphological phenomenon of reduplication) do so by specifically invoking readjustment rule operations. These are the Precedence-Based Phonology theory of Raimy (1999) and the Distributed Reduplication theory of Frampton (2009). In these theories reduplication occurs as an epiphenomenon of some kind readjustment rule applied to a stem.[5] (We will return to a more specific discussion of these theories below).

Various scholars working within the DM framework have objected to the use of readjustment rules, however, including Siddiqi (2006, 2009), Bermúdez-Otero (2012), Bobaljik (2012), Haugen and Siddiqi (2013), and Merchant (2013). Probably none have put their criticism as forcefully as Bermúdez-Otero (2013), who contends that "DM routinely ... resort[s] to devices, like the unconstrained use of readjustment rules, that blur the line between allomorphy and phonology, and destroy the empirical content of the theory" (p.83, as also previously cited by Merchant 2013). With all of these criticisms, both external and internal to DM, in mind, it is well to re-visit some of the precious few previous analyses which have explicitly made arguments in favor of the use of readjustment rules. It is to this task that we now turn.

3. Revisiting Arguments in Favor of Readjustment Rules

Given the strong conceptual arguments which have been lodged against the use of readjustment rules, as discussed above, it is important to note that they may nevertheless be a necessary evil given adequate empirical arguments in favor of their use (Aronoff 2012). In this

[5] The alternative approach is to view reduplicative phonological material as morphemes (Vocabulary Items, or "reduplicants") in their own right. This alternative follows many other affixal theories of reduplication found in the literature. See Haugen (2011) for further discussion and a concrete proposal along these lines, as well as Travis (2003) and Kilbourn-Ceron et al. *this volume* for an alternative approach.

section we will consider the further conceptual issue of readjustment rules as putatively "secondary exponence" in DM (§3.1). Much of our discussion, though, will focus on empirical issues. These include the readjustment rule analysis invoked to account for verb stem allomorphy in Hiaki (Harley and Tubino Blanco 2013), but we will also consider related but slightly more complex data from Classical Nahuatl (Rothenberg and Haugen 2014) (§3.2). We will then examine the verb stem allomorphy co-occurring with reduplication which occurs in the Oceanic language Sye (Frampton 2009) (§3.3). I will argue that none of these instances rise to the level of requiring readjustment rules on either conceptual or empirical grounds, and I will conclude that until such instances can be adduced any theory that *can* do without such readjustment rules should indeed do without them.

3.1. Readjustment as "secondary exponence"

As discussed above, canonical DM makes available two types of exponence: Vocabulary insertion (to discharge morphosyntactic features by giving them phonological content, in the form of VIs, via Vocabulary insertion) and readjustment (to alter the phonological material of previously inserted VIs given the insertion of new VIs, whether overt or not). The former has been regarded as "primary exponence" and the latter as "secondary exponence" (Noyer 1997). One strong hypothesis about these two exponence types is that readjustment rules never express primary exponence, and, on the flip side of that coin, "any secondary exponence of a particular morpheme is accomplished via readjustment rules" (Raimy 1999:61). Thus, Vocabulary insertion has been equated with primary exponence and secondary exponence has been equated with readjustment rule application.

Many cases of morphology apparently utilize both some affix as well as some kind of putative readjustment-induced stem alternation, which leads to an ostensible effect of "double marking" (Halle and Marantz 1993), as is claimed for cases like *sleep* > *slep-t* where a specific VI, the past tense suffix *–t*, is said to induce stem vowel lowering (*/slip/* > */slɛp/*). Indeed, double marking is taken by Embick (2012) to be a positive prediction of DM as a theory. There are a number of conceptual problems with the primary vs. secondary exponence distinction, however, as well as at least one potential empirical problem.

To take the empirical problem first, there may be cases of *triple* marking, which would seem to falsify the double marking prediction. Siddiqi and Haugen (*this volume*) discuss potential examples of this phenomenon, which may include German irregular participles (which can include two affixes as well as verb stem allomorphy, e.g. *schwimm* 'swim' > *ge-schwomm-en*), and a potential, non-productive example from English: *children*, on a morphological analysis holding that *–r*-is not a part of the plural suffix *–en* nor is it a part of the noun root *child*.

Of course, *any* examples of *n*-tuple marking > 2 would be problematic for the double marking prediction based on the two mechanisms of VI insertion and readjustment. I have in mind here examples of extended or multiple exponence of the type discussed by Harris (2009) for Batsbi, which "exuberantly" marks the category of number up to six times in a given verb, with various combinations of gender-number and person-number affixes located in different slots in the verb-word. To the extent that DM claims that such multiple exponence should not exist (cf. Halle and Marantz's 1993 discussion of Potawatomi), such examples seem to pose a problem for the theory. Resolving this issue for the Batsbi data goes beyond the scope of the present paper, but I raise the issue here to show that the supposed "double marking" prediction of DM

may be insufficient to account for such data,[6] if double marking is a real phenomenon at all. (For fuller discussion of double and triple marking, and the argument that these types of multiple marking are epiphenomenal and should not require architectural modifications to morphological theory, see Siddiqi and Haugen, *this volume*).

To turn to the conceptual issues, we start with the hopefully uncontroversial premise that a theory which can get away with implementing only one mechanism of exponence should be preferable to a theory which implements two or more. As just discussed, DM is a theory with two such mechanisms: Vocabulary insertion and readjustment. It may well be the case that no theory could reasonably countenance positing readjustment rules as a its sole mechanism of exponence—this would seem to entail the possibility that every human speech output would have one underlying representation, possibly null, which would then need to be altered by "readjustments" of various kinds given different morphosyntactic configurations. Granting that such a theory is not within the bounds of seriousness, we are then left with the possibility that there could be a theory which only utilizes Vocabulary insertion as its mechanism of exponence. In such a theory,[7] purported instances of stem readjustment would be treated as instances of stem suppletion, where the ostensibly "readjusted form" is actually a VI which is made available by the lexicon for insertion into certain morphosyntactic contexts; for more on this stem-listing approach to allomorphy, see below. As Aronoff (2012) warns us, however, this kind of argumentation, which is a species of Occam's Razor argument, must fall in the face of empirical necessity requiring more mechanisms. We'll return to empirical arguments for readjustment

[6] Presumably, on a readjustment rule analysis, one could always propose that a readjustment rule inserts multiple ostensible affixes as a phonological "readjustment" within a given stem in some specific morphological context(s), but making a move along these lines clearly risks opening the theory to complaints of empirical vacuity (cf. Bermúdez-Otero 2013).

[7] See Haugen and Siddiqi (this volume) for discussion of a theoretical approach to morphology, Restricted Realization Theory, along these very lines.

analyses in sections 3.2 and 3.3, but there are yet more conceptual problems with the primary/secondary exponence distinction that are worth considering before tackling the crucial issue of empirical reality.

One further such problem is that the strong position that readjustment only serves as secondary exponence leads to a requirement that the primary exponent in many cases must be a zero (null) affix, which has been objected to by a variety of scholars (see, e.g., Pullum and Zwicky 1992). It is difficult to conceive of an empirical test which would decide against such analyses.

Another conceptual issue for the primary/secondary exponence distinction in DM has to do with the actual implementation of readjustment rule application as secondary exponence. In practice there are different ideas about where the readjustment rule component of the grammar is situated (as already discussed in 2.2 above), and there are also a variety of ways in which readjustment rules are employed in different analyses.

To return the issue of readjustment rule location first, Raimy (1999) is clear that in his theory of Precedence Based Phonology (PBP) readjustment rules "reside in the morphology module" (p.61) and must do so because that is where the precedence relations among the segments in the phonological representation of specific VIs become established. Phonological operations, including the linearization of segments, follow in the phonology module.[8] For Halle (1990: 157) readjustment rules are also in the morphological component and even precede Spell-Out. Frampton (2009: 34-5) provides a model wherein readjustment follows lexical insertion but can then feed additional lexical insertion, all of which is then followed by cyclic and postcyclic phonology. Other DM theorists, including Embick (2010) and Arregi and Nevins (2012),

[8] In Raimy's PBP theory, reduplication arises as an epiphenomenon of affix-induced stem readjustment which alters the precedence relations in a phonological representation, i.e. "loops" are created and certain segments get pronounced twice, depending on the details of where new links are established by the readjustment rule statement.

however, place readjustment rules squarely in the phonology. Of course, it may well be the case that readjustment rules are littered throughout the morphology as well as the phonology, but if this is the claim then a sober theorist's "Occam sense" ought to be wildly tingling until such distribution is clearly motivated with convincing empirical data.

In terms of implementation of readjustment rules, a variety of triggers are conceivable. For Halle (1990), it is the presence of a morphological context or feature which triggers readjustment (e.g. the feature [Plural], presumably residing in a Num^o head, triggers readjustment on certain nouns, see (1) above). For others, it is the specific Vocabulary Item itself, which is inserted to serve as the exponent of some morphosyntactic feature(s), which is what triggers readjustment. As Frampton (2009) presents this second case, readjustment rules "are triggered *by the vocabulary item*, not by the morpheme it realizes. Different realizations of the same morpheme might trigger different readjustment rules" (p.37, emphasis in original). This kind of approach works well for a language like English where zero affixes can be invoked to account for different realizations of one feature, e.g. [Plural] in irregulars such as *man* > *men* (where the proposed ø-affix triggers vowel raising) vs. *foot* > *feet* (where the proposed ø-affix triggers vowel fronting) vs. *sheep* > *sheep* (where the proposed ø-affix triggers nothing).[9] This approach is much odder for cases where all of the different affixes for a given paradigm induce the same purported readjustment. To illustrate this, consider that in the examples of verb stem alternations in Classical Nahuatl and Sye, to be discussed below, verb stem allomorphy occurs in predictable morphological environments regardless of which of various possible VIs (i.e.

[9] The status of zeros in DM itself may be something which has not been entirely fleshed out. For example, there are two possible approaches to this supposed zero allomorph of the English plural. There could be one zero (ø) suffix, which triggers different readjustment rules for different lists of noun roots, but another possibility is that there are as many zero affixes as there are exceptional patterns, each one specifying one specific readjustment rule to apply to one list of noun roots. It's not clear that there is an empirical ramification requiring one approach over the other.

nonactive suffixes or future tense subject agreement prefixes, respectively) actually serves as the exponents of those environments.

I raise these issues to highlight the fact that there has not been general agreement among DM theorists about exactly how, when, where, or why readjustment rules function in the grammar. One pessimistic interpretation of this disagreement is that such discrepancy is derivative of the stipulative nature of such rules in the first place, and that these kinds of rules essentially get invoked in various analyses however and whenever it is convenient to invoke them. This may be another reason, on top of the ones mentioned above, to view readjustment rules as a suspicious addition to morphological theory.

Again, though, such rules may be a necessary evil given adequate empirical arguments necessitating their use. We now turn to two empirical case studies which have been used to make just such an argument. These involve verb stem allomorphy in Hiaki (and we will also be considering some slightly more complex but related facts from Classical Nahuatl) (3.2.), and then verb stem allomorphy co-occurring with reduplication in Sye (3.3).

3.2. Verb stem allomorphy in Uto-Aztecan: Hiaki (Yaqui) vs. Classical Nahuatl

Harley and Tubino Blanco (2013) (henceforth HTB) provide a nice discussion contrasting the readjustment rule and stem-listing approaches to verb stem allomorphy in the Uto-Aztecan language Hiaki (aka Yaqui or Yoeme), which is spoken in Sonora, Mexico and Arizona, USA. We will review their data and arguments for a readjustment approach over a stem-listing approach, and then consider some related facts from another Uto-Aztecan language, Classical Nahuatl, which has a more complicated system of verb stem and also affix allomorphy which I will argue bears important implications for this debate.

3.2.1. Verb Stem Allomorphy in Hiaki

3.2.1.1. HTB on the Hiaki Data

Verb and noun stems in Hiaki are said to have two forms, one termed 'bound' and the other termed 'free', which surface differently depending on the affix that a given verb or noun takes in some given morphological environment. We will only consider here the allomorphy that appears with verb roots taking various suffixes. For example, the invariant impersonal/passive suffix *–wa* always takes the bound form of a verb, whereas the invariant perfect aspect suffix *–k* always takes the free from. The suffixes that select each of these stem types are listed in (2); the aforementioned suffixes are highlighted here because we will be discussing them in the text and contrasting their behavior with their cognate suffixes in Classical Nahuatl below:

(2) Stem-selecting suffixes in Hiaki: Bound vs. Free (HTB 2013: 118-19 [2])

(a) Hiaki verbal suffixes that require the bound stem (in no particular order)

-tua	(caus)	-'ea	(desid)	-su	(compl)
-se/-vo	(go)	-pea	(desid)	-yaate	(cess)
-tevo	(ind.caus)	-ri	(obj.ppl)	-la	(ppl)
-taite	(inch)	-'ii'aa	(desid)	-siime	(go along)
-ria	(appl)	-tu	(become)	-ri	(ppl)
-naate	(inch)	-hapte	(inch/cess)	-sae	(dir)
-roka	(quot)	-vae	(prosp)	-le	(consider)
-wa	**(pass)**	-ne	(irr)	-na	(pass.irr)

(b) Hiaki verbal suffixes that require the free stem (again in no particular order)

-k	**(perf)**	-ka	(ppl)	-n	(p.impf)
-kan	(p.impf)	-o	(if/when)	-'u	(obj.rel)
-me	(subj.rel)				

The resulting shape of the bound form in Hiaki is an arbitrary feature of verb classes in the language, each of which, under HTB's analysis, results in a different effect when deriving the bound stem form from the free stem form. For the sake simplicity we'll ignore here some of the details of these classes, each of which contains some minor subclasses, and focus instead only on the three general patterns which HTB regard as the primary verb classes.

In Class 1 the bound form is a truncated version of the free form (e.g. *poona ~ pon-* 'play.instrument'); this is the *Truncation class*. In Class 2, an echo vowel appears at the end of the free form stem (e.g. *bwasa ~ bwasa'a-* 'cook'); hence, the *Echo Vowel class*. Class 3 verbs are invariant, undergoing no stem modification whatsoever[10] (e.g. *hamta ~ hamta-* 'break'); this is the *Invariant class*. There are also some highly irregular forms which do not fit into any of these classes (or their subclasses) but which generally share some phonological material between bound and free forms (e.g. *yepsa ~ yevih* 'arrive.SG'); for this reason HTB regard such forms as being irregular but non-suppletive—but, see discussion below.

HTB provide a DM-based analysis to explain the distribution of the bound and free stem forms of Hiaki verbs. On their analysis the bound forms are required by derivational morphemes, and they occur inside a phase boundary. That phase is defined by a Voice^{o} head, which itself selects for the bound form of the verb. Heads higher than that are inflectional and select for the free stem— HTB associate this with an Asp^{o} head.

HTB draw three important implications from their analysis of the Hiaki data:

(i) Readjustment rules (or their equivalent) are necessary in the grammar, in that the derivational suffixes trigger readjustment on the stem, according to arbitrary class feature diacritics;

(ii) These diacritic class features are applied to "List 2 items" (i.e. VIs) themselves, not the abstract Roots ("List 1 items") which the VIs instantiate at Spell-out; this is because suppletive Roots can have VIs which appear in different classes;

(iii) The domain of the readjustment rule application is the phase (defined as *Voice^{o}*).

[10] As HTB note, there is a process of long-vowel shortening which applies to both bound and free forms under affixation in all verb classes. They regard this as a regular phonological process and as such it is not relevant to the debate about readjustment vs. stem-selection morphological analyses under discussion here.

This final point regarding HTB's account as being constrained by phases/cyclicity accords well with recent approaches limiting allomorphy to cycles and linearity (e.g. Embick 2010), though the domain is apparently greater in Hiaki than what is proposed by Embick (e.g. v^o *vs.* $Voice^o$+$Mood^o$). Such constraints, in some form, should also apply to suppletion (and by extension, any kind of stem listing account) however (see Embick 2010, Bobaljik 2012, Harley et al. 2012), so this aspect of the analysis will not further figure into our discussion here.

The upshot of HTB's analysis of the Hiaki facts is that there are two types of suffix in the language, both of which correlate with the free/bound verb distinction: "inner" suffixes (inside $Voice^o$, or $Voice^o$+$Mood^o$) which are derivational and take bound forms, and "outer" suffixes (e.g. Asp^o, higher than $Mood^o$) which are inflectional and take the free form.

Having established the facts of the matter and presenting HTB's general theoretical account of those facts, let us now consider their arguments for a readjustment rule analysis and against a stem listing one.

3.2.1.2. HTB on Readjustment vs. Stem Listing

HTB sketch, but ultimately reject, a possible stem listing approach for the Hiaki verb stem alternations. This approach essentially regards the different stem forms as contextually-specified suppletive variants. This proposal is shown in (3):

(3) A Stem Listing (Suppletion) Analysis of the Hiaki Verb Stem Alternation
(adapted from Harley and Tubino Blanco 2013: 123 [4])

a. $[PON]_v$	'play.instrument'	→	*poona* / ___ Asp^o *pon* Elsewhere
b. $[BWASA]_v$	'cook'	→	*bwasa* / ___ Asp^o *bwasa'a* Elsewhere
c. $[YEPSA]_v$	'arrive.SG'	→	*yepsa* / ___ Asp^o

yevih Elsewhere

d. $[HAMTA]_v$ 'break' → *hamta*

The crux of this analysis is that only one of the two stem forms needs to be specified as contextually-conditioned, and the other can be left to an 'elsewhere' specification. In this case HTB propose to allow the free form to be the specified variant, and its relevant context is Asp^o (to account for the appearance of bound forms with inflectional suffixes); in other forms, i.e. with derivational suffixes, the bound form appears. (3a) shows the case of the truncation class, (3b) shows the echo vowel class, and (3d) shows the invariant class. (3c) is an example of the irregular type which does not fall into one of the other phonologically regular classes. HTB identify this as a major drawback to the stem-listing kind of analysis: i.e. that the irregularity of (3c) is not treated differently from the other classes, each of which involve regular processes that apparently apply to a large set of verbs and which therefore should each be explained by a single generalization, as could be provided within an account utilizing readjustment rules.

This argument is reminiscent of what Embick (2010), in a different context and for a different purpose, refers to as *putative loss of generalization*. In HTB's rejection of the possibility of a stem-listing approach they invoke Embick and Halle's (2005) discussion of stem forms in DM, and raise this putative lack of generalization as a general objection to stem listing. HTB explain the problem as follows:

> If the *sing ~ sang* alternation is treated via listing and competition, exactly as suppletion is treated, the theory itself imposes no principled distinction between suppletion and restricted but basically phonological alternations: the result is simply a cline from maximal irregularity to complete irregularity [sic].[11] In contrast, if the vowel change in *sing ~ sang* is implemented by a morphophonological readjustment rule, it is expected

[11] I think that they must mean "from maximal *regularity* to complete irregularity" here.

> that such alternations should behave in accordance with normal phonological patterns, which, by and large, they do. (p.122)

For the specific case of the Hiaki stem-listing analysis given above, HTB state that such an account faces a severe problem:

> ...lack of insight into the morphophonology of Hiaki...Listed forms need not bear any relationship to their other alternant or to each other. There is no reason why they should fall into the general classes described [above], which are characterizable in broadly phonological terms (Truncation, Echo Vowel, etc.). (p. 124)

Such an approach might predict that strongly suppletive (in the sense of maximally phonologically dissimilar) forms should exist in such a system since there is no proscription against them, but, so the claim goes, these do not actually seem to occur in Hiaki.

The problem with this argument is that nobody has actually successfully proposed a theory-neutral "principled distinction between suppletion and restricted but basically phonological alternations", and there may really only be a cline between maximal regularity and complete irregularity of alternating forms. No theorist has yet sufficiently established an empirical "line in the sand" at which one can incontrovertibly designate the categorical distinction between suppletive and non-suppletive morphology, and such a line is absolutely required by canonical DM to adjudicate when a suppletion or a readjustment analysis is necessary (Haugen and Siddiqi 2013). As Merchant (2013) somewhat humorously puts it,

> Without a criterion for deciding when a morphophonological readjustment rule is involved, and when simple allomorphy, the appeal to unspecified readjustment rules threatens to be no better than Justice Stewart's criterion ('I know it when I see it') and becomes subject to Stainton's (2006) criticism (of elliptical repair effects): it becomes a

'get-out-of-counterexample-free card'. (p.12)

Further, even though HTB do employ readjustment rules to account for the vast majority of stem alternations in Hiaki, they still require some suppletion to account for alternating verbs for which they would dare not appeal to readjustment to derive one form from another because of the radical phonological changes which would be required. These include verbs like *vuite* 'run.SG' and *tenne* 'run.PL' and many others, both intransitive and transitive (see Harley 2014, Harley et al. 2012, and HTB for further examples and discussion of such verbs). Harley and Noyer (2000) summarize the crucial problem:

> [readjustment rules]...have always been problematic inasmuch as no clear criteria were available to separate rule-related pseudo-suppletive morpheme alternants such as *destroy ~ destruct-* from truly suppletive pairs such as *bad ~ worse*, for which no rule was postulated. No interesting theory of Readjustments could be proposed, since any theory that permitted /*bæd*/ to be respelled as /*wərs*/ could presumably do anything. (p.22)

In the framework adopted by Harley and Noyer (2000) and carried over into subsequent DM work such as HTB, "pseudo-suppletive paris like *destroy ~ destruct-* reflect single VIs which are related by Readjustment rules. Truly suppletive pairs however reflect distinct VIs which are not related by Readjustment" (Harley and Noyer 2000:133). We thus have a crystal clear mechanism for accounting for a category distinction, but we still lack any kind of clear criteria for establishing which examples fall into one category or the other. We are thus left with an unfortunate situation where we must rely on the intuitions of a given analyst ("I know it when I see it") rather than being able to let the data tell us how it should be sorted one way or the other. An approach only involving stem-listing does not require such a distinction so such an approach

does not run into this serious problem. See Bermúdez-Otero (2012) and Haugen and Siddiqi (this volume) for further discussion and recent proposals for stem-listing approaches in DM.

Returning to the issue of the putative loss of generalization regarding phonological regularities within the Hiaki stem classes, for this we need only appeal to Embick (2010)'s defense of DM's localist orientation against globalist alternatives:

> ...a localist theory cannot say that a pattern of allomorph selection arises *because of* some output property, phonological or otherwise. To the extent that there are generalizations to be made about surface forms, the localist theory can make them, but they must be derivative of another part of language in the broad sense. That is, the explanations cannot be part of the grammar in the narrow sense; instead, they are the result of diachrony, acquisition, and so on. (Embick 2010: 21)

This comment was directed at globalist approaches which might prefer the phonologically-driven allomorph selection that Embick's localist theory is designed to nullify, but the logic also seems clearly applicable to our discussion of readjustment rules, in that Embick's position clearly removes the burden of explaining similarities within stem classes from the synchronic grammar.

However, there does seem to be a plausible explanation for the phonological similarities across Hiaki stem classes, but one which does not necessarily require invocation of readjustment rules in the synchronic grammar: namely, the "diachrony, acquisition, and so on" alluded to by Embick. Regularity, after all, is as characteristic of language change as it is of synchronic generalizations (if not more so), especially in regard to the phonology and morphology. This is the same explanation that we need for similarities across irregular verb classes in English—e.g. formerly productive phonological rules (such as ablaut) which have left a residue of patterned irregularity in the synchronic grammar of English speakers. What we seem to need is a

synchronic grammatical theory which leaves room for diachronic explanations for certain facts. Such an approach is couched under the rubric of *amphichronic linguistics* by Kiparsky (2006) and Bermúdez-Otero (2014), which seems to be a useful way of thinking about language supported by the discussion here.

In summary, HTB's analysis of Hiaki is particularly elegant because it is supposedly able to link the two alternating verb stem classes to a presumed binary distinction correlating to something like inflection vs. derivation, which HTB tie to unified syntactic environments (i.e. all inflection calls for Stem 1 and is associated with a single syntactic head, Asp^{o}, and all derivation calls for Stem 2 and is associated with Voice^{o}-internal heads.). Further, there are two sets of invariant suffix forms which are said to either trigger the relevant single phonological readjustments on the stems to which they are affixed or not. These facts do not hold for Classical Nahuatl, though, so a readjustment rule analysis loses much of its luster in this other case.[12]

3.2.2. Verb stem allomorphy in Classical Nahuatl (CN)

The main novel empirical contribution of this paper is bringing relevant data from Classical Nahuatl (CN) to bear in this debate between readjustment and listing analyses of verb stem and affix alternations. This is a particularly interesting case because the language is related to Hiaki (indeed, we will be looking at suffixes cognate to some of those discussed by HTB), but I will argue that some of CN's crucial differences weaken HTB's arguments from Hiaki in favor

[12] HTB bring up a second problem for the stem-listing account of the Hiaki data—namely, that noun roots have the same stem classes as do the verbs. They follow the standard approach in DM which inserts syntactic heads (n^{o}, v^{o}) to categorize roots, and raise this as an issue for locality of stem selection given the presumption that such heads are cyclic (as in Embick 2010). However, Merchant (2013) shows that apparent examples of long-distance locality (rather than non-locality) in allomorph selection can be accounted for under a *spanning* analysis, where non-local heads can influence roots and other heads as long as they form a span (in the sense of Svenonius 2012) and intervening material is involved. I assume that this second critique against a suppletive account would be nullified by a spanning account, which could be evoked for readjustment rules as well since they face similar restrictions of cyclicity (pace Embick 2010).

of readjustment over listing. The main point is that there are complexities in the CN data which make it less amenable to the elegant analysis HTB provide for Hiaki, and as such the arguments HTB make in favor of readjustment over stem listing are not supportable for CN.

First, some background on the language. Classical Nahuatl was the variety of Nahuatl spoken at the first Spanish colonial contacts with the Nahuas ("Aztecs") of Central Mexico in 1519 through the mid-17th century. Much colonial documentation of this language exists (see especially the 1571 dictionary by Molina and the 1645 grammar by Carochi (Carochi 1645/2001)). Many modern dialects survive into the present day but our discussion will be focused on the older colonial varieties, henceforth called CN. This discussion rests heavily upon the analysis of CN verb stem and affix allomorphy presented by Rothenberg and Haugen (2014), based on modern descriptions of CN given in such sources as Karttunen's (1983) dictionary and Launey's (2011) grammar.

To recap our discussion of Hiaki in order to highlight the points salient for our discussion of CN, recall that HTB show that Hiaki has two verb stem classes (one bound, one free), which are called for by two sets of affixes (largely corresponding to the traditional notions of inflectional or derivational morphemes) which are themselves invariant. CN, on the other hand, has three or more stem classes,[13] and the suffixes associated with each are also prone to contextual allomorphy. While the Hiaki data may favor an analysis wherein specific suffixes call for one verb stem form or another, in CN the allomorphy is largely bi-directional: verb roots must select for specific non-phonologically-based suffix forms, and these roots also have multiple forms which are selected for by those suffixes. I will argue that the conundrum resulting

[13] Launey (2011) presents 4 "bases" (~ stem classes) for CN verbs, which are heuristics needing justification. As we will see shortly, one of these bases, base 3, is largely phonologically predictable (applying only to verbs ending in two vowels, dropping the second of those vowels) and as such may fall to a phonological analysis. The other 3 bases really seem to be arbitrary, however, and thus the stem system of CN is at least slightly more complex than that of Hiaki. More detail will be given below.

from this complexity is conducive to an analysis wherein both the root and the affix are spelled out in the same phase or cycle, which could involve stem-listing just as well as readjustment.

3.2.2.1. The CN data

Launey (2011) classifies four distinct verb stem classes (in his terminology, *bases*) for CN. He calls Base 1 "the long base", and this form occurs in the present tense and serves as the dictionary citation form of the verb. Rothenberg and Haugen (2014) suppose that this form is the full expression of the root without any morphophonological modifications. Some examples are shown in (4), which also shows some important aspects of CN verbal morphology which will not be touched upon in detail here but which are worth noting, including subject prefixes on the verb complex as well as a plural agreement suffix (*-ʔ*) on plural forms:

(4) CN Base 1 (Long base) forms[14]

a. √*ēhua* 'depart, rise to go' *intr*.

nēhua	*tēhua*	*ēhua*
n-ēhua	*t-ēhua*	*ø-ēhua*
1SG-depart	2SG-depart	3-depart
'I depart'	'You depart'	'S/he departs'
tēhuâ	*amēhuâ*	*ēhuâ*
t-ēhua-ʔ	*am-ēhua-ʔ*	*ø-ēhua-ʔ*
1PL-depart-PL	2PL-depart-PL	3-depart-PL
'We depart'	'You (pl.) depart'	'They depart'

[14] For the CN example glosses I give the traditional citation form in the first line with a parsed form and morpheme-by-morpheme gloss (from Rothenberg and Haugen 2014) in the second and third lines. The CN orthography was largely developed in the colonial period and follows usual older Spanish transcription conventions (e.g. *x* = /ʃ/, *z,ç* = /s/; /k/ is written as *c* before back vowels and /a/ but as *qu* before front vowels, etc.). So, cognate suffixes to Hiaki perfective *–k* and impersonal *–wa* are CN *–c* and *–hua*, respectively (which have the same pronunciations). In citation forms we follow Launey's (2011) transcription of glottal stops, which place a "ˆ" over the vowel preceding the glottal stop, but we include *ʔ* in the morpheme glosses because it can serve on its own as a morpheme/Vocabulary Item (e.g., the plural agreement suffix).

b. √*miqui* ‘die’

nimiqui	*timqui*	*miqui*
ni-miqui	*ti-miqui*	*ø-miqui*
1SG-die	2SG-die	3-die
‘I die’	‘You die’	‘S/he dies’
timiquî	*ammiquî*	*miquî*
ti-miqui-ʔ	*am-miqui-ʔ*	*ø-miqui-ʔ*
1PL-die-PL	2PL-die-PL	3-die-PL
‘We die’	‘You (pl.) die’	‘They die’

Launey’s *Base 2* is “the short base”, and this corresponds more or less with HTB’s analysis of verb stems in Hiaki—most CN verbs in the base 2 form involve some kind of a stem change (including Truncation and Echo Vowel-like Vowel-lengthening subclasses), but there is also an Invariant sub-class which undergoes no modification so that the verb stem in this class appears in the same form as the long base (base 1). Base 2 is selected for by the preterite (simple past) suffix, which appears in one of several allomorphs (*-qui, -c, -ca*; i.e. */-ki/, /-k/, /-ka/*, or Ø;). Some examples are shown in (5):

(5) CN Base 2 (Short base) forms

a. Invariant Sub-class: No stem change: just add the preterite suffix *–c*

√*tōna* ‘be warm, sunny’ > *tonac*
ø-tona-c
3-be.warm-PRET
‘It was warm’

√*ēhua* ‘depart, rise to go’ *intr.* > *ēhuac* *ēhuaquê*
ø-ēhua-c *ø-ēhua-qu-e’*
3-depart-PRET 3-depart-PRET-PL
‘He departed’ ‘They departed’

b. Truncation I: Final Vowel deletion:

√*ēhua* ‘get up’ *tr.(refl)*
> *mēuh* (=*mew*) *mēuhquê* (=*mewkeʔ*)
ø-mo-ēhu-ø *mo-ēhu-qu-e’*
3-REFL-get.up-PRET 3- REFL-get.up-PRET-PL

‘He got (himself) up’ ‘They got (themselves) up’

c. Truncation II: Final Vowel deletion with stem-final C modification

i. m → n / __ #

√*xima* ‘shave’	>	*ninoxin*	
		ni-no-xin-ø	
		1s-refl-shave-PRET	
		‘I shaved (myself)’	

ii. y → { s, ʃ } / __ #

√*piya* ‘guard’	>	*nicpix*	
		ni-c-pix-ø	
		1s-3sg-guard-PRET	
		‘I guarded it’	

iii. t → ʔ / __ # ✪ only for √*mati! --- and only in the singular!*

√*mati* ‘know’	>	*quimâ*	*quimatquê*
		ø-qui-maʔ-ø	*ø-qui-mat-qu-e’*
		ø-3sg-know-PRET	ø-3sg-know-PRET-PL
		‘He understood it’	‘They understood it’

There are a few points worth noting here. First, the intransitive and transitive reflexive stem forms of √*ēhua* ‘get up’, which fall into the Invariant and Truncation I classes respectively, illustrates well that, as for Hiaki, membership in these classes is an arbitrary morphological property and not derivable purely from the phonology nor ascribable to consistent syntactic or semantic properties (e.g. transitivity or reflexivity) (Rothenberg and Haugen 2014). Also, there are some phonological consistencies within some sub-classes, as with the treatment of consonants after vowel loss (e.g. y > s and m > n). However, these processes are not necessarily entirely ascribable to phonology either, as seen with the Base 2 form for √*mati* ‘to know’ which apparently uniquely employs a rule *t > ʔ* after vowel loss. Note that other verbs are just fine with verb-final *–t* after final V-deletion applies:

(6) –*t* as an acceptable stem-final consonant after vowel deletion in Base 2

√*tlācati* 'to be born'	>	*tlacat*	*tlacatquê*
		ø-tlacat-ø	*ø-tlacat-qu-e'*
		ø-be.born-PRET	ø-be.born-PRET-PL
		'He was born'	'They were born'
		**tlacâ*	
		ø-tlaca?-ø	

Because such examples are very similar to Hiaki in that most stem material remains identical from one stem form to the next (i.e. between base 1 and base 2) these should be amenable to a similar readjustment rule analysis as to what HTB propose for Hiaki. One interesting difference between the two languages, however, is that these CN base 2 forms are only used in the preterite, and presumably involve the syntactic head T^{o}; this CN suffix is cognate with the Hiaki perfective aspect suffix *–k*, which is a full stem-taking suffix of Hiaki which HTB associate to Asp^{o}. This preterite suffix is presumably inflectional like the Hiaki perfective, but, unlike Hiaki, in CN this inflectional suffix calls for a modified stem form rather than the full stem form which is more characteristic of the present tense. What are the other stem forms in CN?

Base 3 verbs, according to Launey's scheme, are "the middle base" and, according to Rothenberg and Haugen (2014) may be possibly associated largely with irrealis forms: imperative/optative, future, imperfect, and vocative. The formation of these forms involves the use of base 1 forms, with vowel deletion in the case that the verb root ends in two vowels (e.g. √*tēmoa* 'search/look for' > *xi-c-tēmo* 2.IMP -3s-look.for 'Look for it'); an example of a simple future form is √*cochi* 'sleep' > *ni-cochi-z* 1S-sleep-FUT 'I will sleep', and an example of a simple imperfect form is *ni-cochi-ya* 1S-sleep-IMP 'I was sleeping'. If future tense is associated with the same head (T^{o}) as the past tense preterite, then it seems clear that different stem forms

will be called for by different values of T^{o} (i.e. base 2 or base 3 depending on past or future tense value of T^{o}). This is fine on an analysis, as proposed by Frampton (2009), where it is the VIs inserted at T^{o} which would call for specific readjustments (or not).[15] For example, √*cochi* takes final vowel deletion with the preterite (i.e., in base 2, thus: *coch-que* and not **cochi-c*) but it retains its stem-final vowel in the future and the imperfect (i.e., in base 3, *cochi-z*, *cochi-ya*). On the other hand, √*tēmoa* loses its final vowel in both the preterite and the future (thus, its base 2 form is *temo-c* and not **temoa-c*, and its base 3 form is *temo-z* and not **temoa-z*). We could account for this variation by positing two suffixes shared by √*cochi* and √*tēmoa*: the preterite suffix *–c* which triggers a final vowel deletion readjustment on a certain class of verb stems which includes both √*cochi* and √*tēmoa*, and the future suffix *–z* which triggers this same readjustment on a more narrow set of verbs, including √*tēmoa* but not √*cochi*.

In our exposition so far we've been ignoring the fact that some suffixes also show allomorphy, e.g. the preterite *–c, -ca, -qui*, because much of this may well be phonologically-conditioned (e.g. the preterite is null for √*ēhua*, plausibly because truncation of the stem plus –c would lead to an illicit word-final consonant cluster, **-ewk*; on the other hand, this analysis does not explain why the vowel-final allomorph of *–c* does not arise, i.e. there is no form ?*mew-qui* which would be fine phonologically).

When we turn to Launey's base 4, we find an example of contextually-specified allomorphy which clearly cannot be reduced to mere phonology. Specifically, Launey's base 4 is used for the non-active (impersonal, passive) suffix, which is traditionally regarded as a selection between one of two options (*–lo* or *-hua*, according to impersonal or passive status, respectively).

[15] Note that in HTB's readjustment and stem listing analyses for Hiaki, it is the morphosyntactic context (i.e. syntactic heads) rather than the actual VIs which are specified as the context for readjustment. As Maire Noonan (personal communication) points out, there is a possible alternative analysis of CN wherein the 'future' (or *irrealis*) suffix is not realized at T^{o} at all, but at some higher inflectional head(s), e.g. Mood^{o}, which would be consistent with HTB's approach.

Rothenberg and Haugen (2014) show at length that there are many exceptions to any effort to generalize the motivation for choosing one suffix over the other (i.e. animacy, transitivity, phonology, etc. all fail to explain the distribution), and they argue that membership must involve arbitrary morphological classes, as is the case for stem form selection in Hiaki. Further, they argue that there are (at least) three distinct non-active suffixes involved: *-hua, -lo*, and *–o*.[16]

In general, many base 4 verbs are derived from base 3 with the addition of one of the suffixes *–hua* or *–lo*:

(7) CN Base 4 (Nonactive) Verb Forms

a. Full stem

pōhua	*pōhuaz*	*pōhualo*
pōhua	*pōhua-z*	*pōhua-lo*
count	count-FUT	count-PASS
		'it is counted'

b. Stem with final V deletion

machtia	*machtiz*	*machtilo*
machtia	*machti-z*	*machti-lo*
teach	teach-FUT	teach-PASS
		's/he is taught'

There are, however, two crucial exceptions. The first are verbs ending in *ca* or *–qui*, which usually take the form *–co*. Rothenberg and Haugen (2014) regard this as a suffix *–o* with a modified stem form involving final vowel-deletion, as in (8):

(8) Verbs ending in *-ca* or *–qui* > *-co* **(i.e. *–o*)**

maca		*maco*[17]
maca	>	maca-o
give		give-PASS

The second is what are called "doublets", which are verbs that can form the passive in different ways (including suffixing *–lo* or *–hua*, or, in many cases, both). This optionality introduces a

[16] This final *–o* is often regarded as an allomorph of either *-hua* or *-lo* (or both), leading to an analytical difficulty in separating verb stems and their alternants from non-act suffixes and their alternants. Rothenberg and Haugen give arguments supporting *–o* as a VI in CN grammar, leaving open the possibility that it may have originated etymologically from *–lo* or *–hua*.

[17] But cf. the alternant nonactive form *macalo*.

new and interesting complication that we won't explore here, but there are interesting implications for either stem listing or readjustment analyses.[18]

(9) CN Nonactive "Doublets"

-lo OR *-o*					
a.	*tlaça*	>	*tlaçalo*	OR	*tlāxo*
	tlaça		tlaça-lo		tlax-o
	hurl.down		hurl.down-PASS		hurl.down-PASS
-lo OR *-hua*					
b.	*çō*	>	*çōhua*	OR	*çōlo*
	çō		çō-hua		çō-lo
	bleed.s.o.		bleed.s.o.-PASS		bleed.s.o.-PASS

Let us consider the multiple stem forms for one verb which is particularly revealing of the interactions of allomorph selection and thus most pertinent to our discussion of readjustment vs. stem listing approaches—namely, the root *mati* 'to know', which has the stem forms: *mati* (base 1 and base 3), *maʔ-* (base 2), and *mach-* (base 4). These alternating stem forms are illustrated with examples in (10):

(10) Stem forms for CN √mati 'to know'

Base 1	(present tense)	*mati-*	*nicmati* *ni-c-mati* 1ss-3so-√mati 'I know him/her'
Base 2	(preterite)	*maʔ-*	*quimâ* *ø-qui-maʔ-ø* 3ss-3so-√mati-PRET 'He understood it'
Base 3	(future, imperfect)	*mati-*	*nicmatiya* *ni-c-mati-ya* 1ss-3so-√mati-IMPERF 'I knew it'

[18] The clear alternatives seem to be listing multiple stem or affix forms for a suppletion approach, and having optional readjustment rules on a readjustment approach.

Base 4	(Nonactive)	*mach-*[19]	*macho* *ø-mach-o* 3ss-√mati-PASS 'S/he is known'

It turns out that the stem *mach-* is also associated with the causative suffix *–tia* (*machtia* 'teach'). How should we go about accounting for these stem classes?

3.2.2.2. The CN analysis

The disparate analyses of these stem forms for √mati should be clear. On a stem listing suppletion approach, there are three VIs for √mati, specified for insertion into different morphosyntactic contexts. We'll adopt an analysis based on the stem-listing approach for Hiaki suggested (but rejected) by HTB; however, in this case we will be specifying particular VIs as contexts for stem selection, as opposed to specific syntactic heads (since different tense suffixes, for example, call for different stems):

(11) A Stem-Listing (Suppletion) Analysis of Stem Forms for CN √mati 'to know'

$[\sqrt{\text{MATI}}]_v$	'know'	→	*ma?* / ___ $\text{-Ø}_{[\text{preterite}]}$
			mach / ___ $\text{-}o_{[\text{Nonact}]}$ OR $\text{-}tia_{[\text{Caus}]}$
			mati Elsewhere

Alternatively, on a readjustment rule analysis, those same specific VIs can be said to alter the underlying root form (√mati) with specific readjustment rules, as in (12):

[19] Karttunen reports that *mati* is a doublet, with an alternant nonact(ive) form, *mati-hua*. On Rothenberg and Haugen (2014)'s analysis, this can be accounted for by allowing this stem to take one of two optional nonact suffixes: *–hua* or *–o*. The suffix *–hua* in turn selects for the full stem ("base 1") form (or triggering no readjustment on the stem, under a readjustment rule analysis). The suffix *–o* always takes a truncated form (or, on the readjustment rule analysis, it always triggers vowel-deletion—and sometimes this vowel deletion co-occurs with additional stem-final consonant modification, as is the case here).

(12) A Readjustment Rule Analysis of Stem Forms for CN √mati 'to know'

a. Vowel Deletion and Glottalization

$tV \rightarrow$ *ʔ* / __]⁀ -$Ø_{[preterite]}$
Condition: Only in the set of roots {√mati }

b. Vowel Deletion and Palatalization

$tV \rightarrow \widehat{tʃ}$ / __]⁀-$o_{[Nonact]}$
OR
/ __]⁀-$tia_{[Caus]}$
Condition: Only in the set of roots {√mati }

Under this analysis the default form of the root would surface as *mati* except in the special case of the preterite (presumably due to [past] feature on Tº) or the Nonactive or Causative (presumably involving features associated with Voiceº).

The problem with either analysis is that they both fail to provide insight into why these conditions on the allomorphs pattern the way they do. Recall that one of the features of HTB's analysis of the Hiaki facts was that stem classes supposedly correspond to structural positions (~cycles) in that language. For CN, though, this is not the case—only the [past] tense associated with Tº in the preterite causes a particular stem change for √mati, which appears in its full stem form for other values of Tº (e.g. the present). Likewise, it is not obvious why only the nonactive and causative suffixes trigger a different readjustment for whatever their feature values may be at Voiceº.

The second feature of HTB's readjustment analysis is that it is said to be able to explain phonological similarities across stem classes in Hiaki. This is also not available for the CN case, as different affixes will trigger different readjustment rules in CN with no consistent patterns across classes. The non-act suffix *–o,* for example, will always trigger readjustment of some

kind, but there are different readjustments that occur. The palatalization seen with √mati, for example, seems to be unique to that specific verb.

Further, Embick and Halle (2004) and HTB (2013) have responded to criticisms claiming that readjustment rules are too powerful (e.g. supposedly, according to the oft-repeated critique, "anything goes") by maintaining that these kinds of rules should be limited to regular rules available to the phonology. In this way, "natural" rules can be appealed to in readjustment rule analyses while unnatural ones should be avoided. Ignoring the case of debuccalization of /t/ to glottal stop in the CN base 2 form, one can clearly see how the palatalized stem *mach* could have developed from the root form *mati* given a derivational analysis invoking palatalization preceding the deletion of stem-final vowels. This kind of derivational analysis is shown in (13) below:

(13) A (synchronic) derivation of the CN stem form *mach-* from *mati*

UR:	/ # mati – o # /
Palatalization:	# machi – o #
Final V Deletion:	# mach – o #
PR:	[macho]

This is certainly a plausible historical origin for this stem form, as was pointed out by Edward Sapir (1913:419) well over half a century before the formalization of serial rule applications altering surface representations en route to generating surface forms (i.e. *SPE*). Do we really need to have this process be instantiated as a synchronic derivation in the language, though, or can we give way to amphichronic explanation?

In my view, the problem with (13) as a synchronic analysis for CN is the inverse of HTB's problem with stem-listing as an analysis of Hiaki—namely, that it gives a false *illusion of*

insight into the morphophonology of this language. (Contrast this with HTB's complaint that a stem analysis for Hiaki lacks insight into the morphophonology of that language). Specifically, it must be pointed out that this supposed palatalization, while natural enough cross-linguistically, has nothing whatsoever to do with the synchronic phonology of the language. The phonetic sequence of [–*ti*-] is perfectly acceptable in the more general grammar of CN, as seen in the non-nonactive stem forms for √mati, as well as plenty of other roots and even affixes (e.g. –*ti* 'inceptive', -*tia* 'causative', -*ti*- ligature, etc.) which occur elsewhere in the language. While palatalization of /t/ in front of high vowels may be a natural synchronic rule of some languages, and of course it is also a natural form of diachronic sound change in many languages, *palatalization is not a general phonological rule of CN outside of this limited example*.

I conclude that while there may appear to be benefits of adopting a readjustment rule analysis for verb stem allomorphy in Hiaki, these benefits are not available for the slightly more complex case of verb stem allomorphy in CN.

3.2.3. Interim conclusion regarding Uto-Aztecan stem allomorphy

In sum, inasmuch as HTB's arguments rely on the observation that Hiaki verb stem classes are binary and derivable from some aspect of syntactic structure (e.g. particular heads associated with binary notions like 'inflection' and 'derivation'), their analysis may elegantly account for the Hiaki facts. However, CN verb stem allomorphy is not binary and the verb stem classes cross-cut morphosyntactic categories (in having multiple stem forms being associated to the same syntactic head, and multiple heads associating to a single stem form) and thus cannot be reduced to such an elegant analysis. While HTB's argument for phonological similarity of verb forms across stem classes applies to CN just as it does to Hiaki, I suggest that an amphichronic

explanation, which appeals to diachronic development of stem forms to be learned by the native speaker, accounts for these similarities just as well as a synchronic readjustment rule-based analysis. Readjustment rule analyses must suppose a categorical distinction between "true" and "pseudo"-suppletion, however, which is problematic at best. Thus, I regard the debate over Uto-Aztecan stem allomorphy as coming in at a stalemate as far as the empirical evidence in concerned, but tending towards the stem-listing approach when we bring in conceptual considerations.

We turn now to a different set of data which has been claimed to involve empirical evidence for readjustment rules, this time involving the interaction of stem allomorphy in derivation with other morphophonological processes such as reduplication.

3.3. Verb Stem Allomorphy Plus Reduplication in Sye (Erromangan)

Frampton (2009) raises the issue of competing analyses of English irregular past tense alternations like *sell* > *sol-d*, which have been given both a readjustment analysis, wherein the alternation is said to be triggered by the VI realizing past tense (thus, the suffixation of past tense *–d* leads to a vowel change in the root *sɛl* to generate an output of *sol*),[20] as well as a suppletion (stem listing) analysis, wherein the lexicon is said to store two alternating stem VIs for the root √SELL, *sɛl* and *sol*, which compete for insertion into different environments ([+past] for *sol*, with *sɛl* appearing elsewhere).[21] Frampton notes that one way to furnish evidence that "*sol* is derived from *sɛl* in the morphophonology would be to find some operation which applies to *sɛl* before it is transformed to *sol* that leaves trace of *sol*'s previous form. Unfortunately, the morphophonology of the English past-tense system is not complex enough to provide evidence

[20] This rule of stem-internal vowel change actually applies identically to a very small set of verb roots in English, including *sell* and *tell.*
[21] On this analysis, *tell* similarly has two competing VIs: *tel* and *tol*.

of this kind" (p.44). He goes on to argue, however, that such evidence *is* available in Sye, the data of which involve complex rule interactions co-occurring with the morphophonological process of reduplication. We will review Frampton's argument from Sye here and compare that to an alternative stem-listing, suppletion-based analysis of the same data which had been previously provided by Inkelas and Zoll (2005).

Sye (aka Erromangan)[22] is an Austronesian (Oceanic) language spoken on Erromango in the island nation of Vanuatu. The data under discussion come from a grammatical description provided by Crowley (1998). To begin, it is important to note that verb roots can appear in one of two stem forms: either the "basic root" (BR) form or the "modified root" (MR) form. Verbs are categorizable into two classes which are largely phonologically based—weak verbs (which have a transparent derivation of the MR form where *n-* is prefixed to the BR root form) and strong verbs (which have much more interesting/much less transparent morphophonology going on, to be discussed in detail below).[23] Some examples of BR and MR forms for weak and strong verbs are given in (14):[24]

[22] In his grammar of the language, Crowley (1998) uses the language names *Sye* and *Erromangan* more or less interchangeably. While *Sye* (also, *Sie*) is the traditional name, it is "the increasingly common practice among educated local people of referring to it in English simply as *Erromangan*" (p.1). In their theoretical analyses of data presented by Crowley, Inkelas and Zoll (2005) use *Sye* while Frampton (2009) employs *Erromangan*. Because there were as many as three (and maybe as many as six or possibly even more more) languages spoken on the island of Erromango before European colonial invasion and subsequent indigenous de-population, I will use *Sye* to distinguish this language from the other indigenous languages of Erromango. These include Ura (now moribund) as well as extinct languages noted in the historical record, such as Novul-Amleg, Utaha, Uravat, and Enyau/Yocu, which may have been their own distinct languages but for which conclusive information on this point is largely lacking (Crowley 1998: 1-3).

[23] The phonological bases for the strong/weak class distinction is as follows: weak roots include "all roots that begin with a glide, a high or low vowel, or an alveolar consonant", and strong roots include "all roots beginning with a labial consonant" (Frampton 2009: 46). Roots beginning with a mid-vowel (i.e. *e* or *o*) must be characterized by a class feature since no grammatical (phonological, morphological, syntactic) information predicts which class a given root will fall into: e.g. the minimal pair *owi* 'plant' and *owi* 'leave', for example, involves a weak root and a strong root, respectively.

[24] I follow Frampton (2009) in deviating slightly from Crowley's (1998) practical orthography to give the IPA value for two of Sye's consonants: /ŋ/ instead of Crowley's *g*, and /ɣ/ for Crowley's *c*. Frampton is a bit inconsistent on this point, and Inkelas and Zoll (2005) use Crowley's orthography, so I have standardized transcriptions for all three sources by implementing these two changes for all Sye examples used in this paper.

(14) Sye Basic Verb Forms and Modified Verb Forms

Weak Verb Forms

	BASIC ROOT	MODIFIED ROOT	ANALYZED MR FORM	GLOSS
a.	aruvo	naruvo	n-aruvo	'sing'
b.	tovop	ntovop	n-tovop	'laugh'

Strong Verb Forms

	BASIC ROOT	MODIFIED ROOT	ANALYZED MR FORM	GLOSS
c.	vaŋ	ampaŋ	am-paŋ	'eat'
d.	oɣol	aŋkol	aŋ-kol	'dig'
e.	oɣhi	aŋhi	aŋ-hi	'see it'
f.	omol	amol	a-mol	'fall'

Suffice it to say at this point that an initial analysis of these two verb classes seems to show that the weak verbs simply add the nasal segment *n-* as a prefix to the BR form, while the strong class seems to add *aN-* (if it can) which in turn deletes the original initial vowel of the BR form. We'll flesh this out shortly.

In the meantime, let us consider additional relevant Sye morphology. In particular, there is a common pattern of reduplication which Frampton calls the *intensive* (INT), and this involves full reduplication of the BR form, as shown in (15):

(15) Intensive Reduplication in Sye (Frampton 2009: 45)

a.	omol	'fall'	>	omol-omol	'fall all over'
b.	amon	'hide'	>	amon-amon	'hide all over'
c.	avan	'walk'	>	avon-avon	'walk all over'
d.	alou	'run'	>	alow-alou	'run all over'

The BR form is the most common form found in Sye verbs and it is taken by Crowley to be the default verb form. The MR form is restricted to only a handful of environments, including especially following the future tense subject prefixes as well as some other environments involving "discontinuously marked categories" in certain inflectional contexts and also following "echo subject markers" (Crowley 1998: 79-80). We will only consider the future tense cases here, as these are exemplified in detail for their interactions with reduplication.

Under intensive reduplication in the future tense, which calls for the MR form, subject prefixes appear on the verb stem and these co-occur with the MR as the first copy in the complex verb construction. The controversial issue is the appropriate analysis of the alternant MR verb stem occurring between the inflectional prefix and the BR form in this construction. An example is shown in (16), and instructive differences in the analyses of this pattern can be inferred from the different morphological glosses given in the second line, which are provided by Crowley (1998) (16a), Frampton (2009) (16b), and Inkelas and Zoll (2005) (16c), respectively:

(16) Reduplication with the "Modified Root" in the Future Tense of the Sye Intensive

a. ɣw-amol-omol
3PL.FUT-MR[25].fall-REDUP
'they will fall all over' (Crowley 1998: 79)

b. ɣw-amol-omol
3PL.FUT-fall (intensive)
'they will fall all over' (Frampton 2009: 45 [67])

c. ɣw-amol$_2$-omol$_1$
3PL.FUT-fall$_2$-fall$_1$
'they will fall all over' (Inkelas & Zoll 2005: 54 [40])

On the one hand Crowley (1998) includes reduplication as its own morphological "piece", a suffix, in his morphological breakdown, but on the other hand Frampton does not indicate it as such because in his theory of Distributed Reduplication (DR) the reduplicated material is not associated to a morpheme as such, but rather is the epiphenomenon of a readjustment operation on a stem triggered by another VI (in this case, the future subject marker *ɣw-*, as will be discussed in more detail below). Inkelas and Zoll (2005), on a third hand, present a suppletion analysis wherein two separate VIs are compounded together in this construction (the BR and MR

[25] Crowley's "MR" is a gloss for "modified root", designating that the root appears in its modified root form rather than in its unmodified "basic root" (BR) form. This MR form is taken to be "Stem 2" by Inkelas and Zoll; Frampton does not give a special indication for it as he regards its appearance as an epiphenomenon of readjustment-triggered root modification rather than as a morpheme in its own right.

forms are thus represented as by Inkelas and Zoll as suppletive allomorphic stems such as *omol* "$fall_1$" and *amol* "$fall_2$", etc.). Let us consider the suppletion and readjustment analyses of these data in turn (sections 3.3.1 and 3.3.2, respectively).

3.3.1. An analysis based on suppletive stems – Inkelas and Zoll (2005)

The key piece of Inkelas and Zoll's analysis of the verb stem alternation in Sye reduplication is their claim that the modified forms of roots are not amenable to a unified phonological analysis. As they put it,

> [e]ven where the mapping [of root allomorphs] is systematic...there is no unitary process that can be appealed to of the sort that makes a phonological account....possible. At least some Sye root alternants must be lexically listed; we make the simplifying assumption here, adopting Zuraw's (2000) approach to patterned exceptions, that the root alternants are all listed, although the argument would not change if the phonology of Sye were allowed to derive some of the allomorphy. (p.53)

Thus, there are some irregularities involved which will require a suppletive analysis for at least some of the stem alternants in Sye, and, in addition, some of the rules which would need to be applied in a derivational analysis (see below) seem to them "unnatural", so Inkelas and Zoll essentially maintain that all of the alternants are suppletive (even where they may appear to be regular).

Frampton (2009) objects to Inkelas and Zoll's objection of the readjustment account, largely for the same reason that HTB object to a similar account of stem forms in Hiaki—namely, that there are phonological regularities and the derivation of the modified form in most cases is predictable. The suppletion approach in this case, according to Frampton, "is a difficult

proposal to defend" and offers "no clue" about why such derivation should be so transparent"; rather, "[a] suppletive analysis says it is an accident. A readjustment analysis has a simple answer. They are all formed in the same way, by rule, from the basic root" (p.48).

It seems that the response to this objection has already been previsioned in our discussion of Hiaki—namely, that it is possible that some apparent regularities in synchronic grammar fall out of diachronic change, as per the amphichronic linguistics program. We thus seem to be at a stalemate here, since stem-listing suppletion and readjustment can both technically do the job of meeting empirical adequacy and each have their proponents and detractors regarding conceptual considerations. Therefore, let us consider in detail Frampton's empirical argument in favor of readjustment rules, which involves the supposed emergence of modified forms from basic forms in a serial derivation.

3.3.2. Frampton's (2009) derivational account of modified forms from unmodified forms in Sye

Frampton largely follows Crowley's original derivational analysis of the Sye facts, and he invokes a variety of rules to be applied in sequence to account for those facts. These rules (named by Crowley) include:

- A Rule of *a*-Accretion – which prefixes an *a* (and over-writes a word-initial V, if relevant);
- A Rule of Nasal Accretion – which creates a homorganic NC cluster,

  VC... → VNC... ;
- Despirantization – which forces fricatives in NC clusters to become stops;
- Triconsonantal Cluster Reduction – which reduces triconsonantal clusters.

Frampton's proposed derivation of Sye modified forms is given in (17).

(17) Frampton's Derivation of Modified Forms from Basic Forms in Sye (2009: 47 [69])

BR	Nasal Accretion	*a*-Accretion	Despirant.	Cluster Reduct.	Gloss
a. vaŋ	mvaŋ	amvaŋ	**ampaŋ**	-----	'eat'
b. oɣol	oŋɣol	aøŋɣol	**aŋkol**	-----	'dig'
c. oɣhi	oŋɣhi	aøŋɣhi	aŋkhi	**aŋhi**	'see it'
d. omol	-----	**aømol**	-----	-----	'fall'

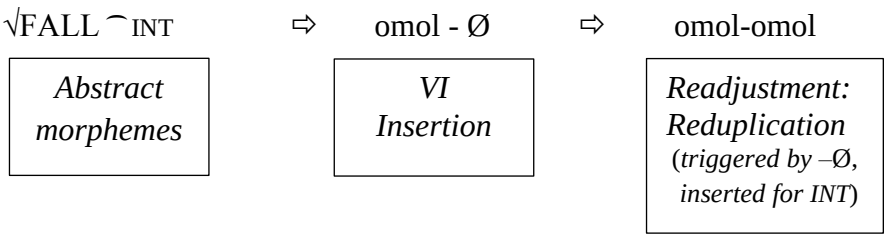
The BR form is taken to be the underlying representation and is given at the left. The serial derivation then proceeds to the right, with each successive modified form given under the rule that applies to it (if a rule applies to it). The derived MR is given in bold, and is the last form which has a rule apply to it (e.g. since cluster reduction is not relevant to *vaŋ* 'eat' or *oɣol* 'dig', their MR's are fully formed after the application of Despirantization; similarly for *omol* 'fall' which is fully derived after the application of *a*-Accretion). (Note that (17) follows Frampton's notation for *a*-Accretion, which for simplicity's sake shows both the addition of prefixal *a* and the deletion of the stem's first vowel (if relevant). Nothing important seems to hinge on this representation of two processes in one rule; the deleted original stem initial vowels are given with a strikethrough).

This derivational story, again, modifies the basic root form given a certain morphosyntactic context, in particular for our purposes here, the future tense which also involves subject agreement prefixes. On Frampton's account, each of these prefixes, as VIs, triggers the relevant readjustments on the stem to derive the modified root stem. How does this process interact with reduplication?

In Frampton's theory of Distributed Reduplication (DR), reduplication also results from a readjustment operation applied to a stem given the insertion of a particular VI. For the intensive

reduplication pattern of Sye, the relevant readjustment-inducing VI is most likely to be a zero-affix inserted to realize the intensive (INT) morpheme, which is presumably attached to some syntactic head like Mood^{o}--the specific details of where this morpheme comes from are not entirely relevant here, as long as there is a way to get the INT morpheme into the verb complex (and some place in the syntactic tree for the reduplication to originate). We'll not delve into the mechanics of the copying process in DR, as these involve a complex set of proposals for the insertion of duplication junctures leading to long-distance geminates, etc., the details of which would take us far afield from the more general point. Because the Sye examples involve full stem reduplication let's abstract away from the mechanics and just call the DR process of copying and repeating stem material the *Reduplication Rule*, and allow this rule to be ordered with respect to other phonological rules. The derivation of Sye non-modified intensive reduplication would look something like this:

(18) DR Derivation of Intensive Reduplication, From Syntax to Phonology



In the future tense, this situation gets complicated by the additional presence of the subject agreement prefix, which will trigger appropriate readjustments on the verb stem adjacent to it. Again, in Frampton's theory this readjustment is induced by specific VIs rather than merely having the root appear in some context (e.g. next to a [future] feature on T^{o}, etc.). Let's summarize the weak verb class rules as *Accretion* (shorthand for the entire derivation shown in 17 above). Note that it is crucial that the Reduplication rule applies *before* the Accretion

processes, otherwise we would expect the modified stem form to appear in both copies of the reduplication construction (contrast 19a with 19b):

(19) DR Derivation of Future Intensive Reduplication, From Syntax to Phonology

a. *ɣw-amol-omol* 'they will fall all over'

Agr_S-T ⌢ √FALL ⌢ INT	⇨	ɣw - omol - Ø	⇨	ɣw-omol-omol	⇨	**ɣw-amol-omol**
Abstract morphemes		*VI Insertion*		*Readjustment:* ***Reduplication*** (*triggered by* –Ø, *inserted for* INT)		*Readjustment:* ***Accretion*** (*triggered by* ɣw-, *inserted for* Agr_S-T)

b. * *ɣw-amol-amol*

Agr_S-T ⌢ √FALL ⌢ INT	⇨	ɣw - omol - Ø	⇨	ɣw-amol - Ø	⇨	***ɣw-amol-amol**
Abstract morphemes		*VI Insertion*		*Readjustment:* ***Accretion*** (*triggered by* ɣw-, *inserted for* Agr_S-T)		*Readjustment:* ***Reduplication*** (*triggered by* –Ø, *inserted for* INT)

This is not exactly what Frampton had promised in his discussion of English *sɛl* and *sol*, which was, now substituting *omol* for *sɛl* and *amol* for *sol,* to "find some operation which applies to [*omol*] before it is transformed to [*amol*] that leaves trace of [*amol*]'s previous form" (p.44).

With this analysis in hand, though, Frampton (2009) declares, "I view the modified form *[ɣ]w-amol-omol*...as a spectacularly clear demonstration of the fact that root modification is in the morphophonology" (p.47). Frampton's discussion is specifically critiquing Inkelas and Zoll's theory of reduplication (MDT) which proposes that no reduplication truly involves phonological copying. In Frampton's concluding remarks on Sye, he says, contra Inkelas and Zoll, that "*amol-omol* gives no evidence that calls into question the fundamental role that copying in the phonology plays in reduplication. But it does give powerful evidence for morphologically conditioned readjustment" (p.49).

3.3.3. Evaluation: Stem listing (suppletion) vs. readjustment in Sye

Frampton's discussion of Sye verb alternations promises to evince readjustment rules because of their interactions with a different morphophonological process—reduplication. At first blush this seems to be the case because, after all, the *ɣw-amol-omol* example purports to show the derived form, *amol*, sitting right next to its underived counterpart, *omol*, in the very same word. However, this is not necessarily actually the case. On the contrary, what the *ɣw-amol-omol* example may really be showing us is that the root *omol* is adjacent to the future tense agreement prefix *ɣw-*, which either triggers a readjustment on the adjacent verb stem (on a readjustment analysis) or which selects for the "modified root" stem form (or "stem 2", etc.) of *omol*. This state of affairs would be the case even without reduplication being present at all (i.e. with a third person agreement prefix but without the reduplication-triggering intensive suffix, cf. *ɣw-amol* 'they will fall', rather than **ɣw-omol*).

What would be ideal to show that readjustment really is involved, and in particular that the reduplication process itself is derived via a rule within a larger set of serially ordered rules, would be real rule interactions which would otherwise lead to opacity effects. For example, ordering readjustment before reduplication to yield the modified form in both copies (e.g. the unattested form *ɣw-amol-amol which would be derived by 19b, which would be reminiscent of an "overapplication" effect). Or, better yet, if Reduplication occurred anywhere along the line of the derivational path sketched by Frampton in (17) above, which it should be able to do given the architecture of DR. In fact, Frampton's ordering of rules is slightly different than what is proposed by Crowley, who places a-Accretion and Vowel Deletion last in his derivation. In Frampton's paraphrase (fig. 17), those two come first. I presume that Frampton did this because those rules are morphologically relevant (i.e. triggered by readjustment) and the other rules are

taken to be regular rules of phonology, but it's not clear to me that readjustment rules cannot be ordered lower down among the regular rules of phonology. Indeed, the stipulative and parochial nature of rule orderings, as illustrated by competing proposals which make no apparent empirical differences, seems to be a problem for such rules in general. If the intermediate representations posited by Frampton's serial derivation analysis are really entities in the world then the grammar should be able to access them for reduplicative copying, given Frampton's DR system. If no empirical data show such evidence, then Zwicky and Pullum (1992)'s complaints against stipulative parochial rule ordering have even more force.

Like Harley and Tubino Blanco (2013), Frampton appeals to an argument from ostensible regularity in his objection to Inkelas and Zoll's stem-listing analysis of Sye, because of the apparently regular development of modified forms from basic forms in synchronic Sye grammar. Under a stem-listing, suppletion analysis like that offered by Inkelas and Zoll, "massive and transparent regularity in the lexicon would have no explanation" (p.49). I disagree with this criticism, if such massive regularity can be explained instead by the diachronic development of stem forms. Other regular aspects of Sye synchronic grammatical description do seem to happily fall under such an account, such as with the large proportion of noun roots (according to Crowley 1998:55, "over 60%") which have developed an initial *n-* through the historical reanalysis of an earlier article of the form **na*. Unlike closely related Oceanic languages which show some separation of *n-* and the noun root in some grammatical contexts,

> [i]n Sye, initial *n-* is much more tightly bound to the historical root, and with the vast majority of nouns there is no synchronic evidence at all for recognizing any kind of boundary between *n-* and the remainder of the root. However, some *n-* initial nouns lose

this historically reanalyzed article in environments that are similar to some of the contexts in which *n-* is productively lost in [related languages]. (Crowley 1998:55).

Such contexts include, tellingly, compounding and reduplication. For example, the noun stem *nvat* 'stone' has the compounding form *vet-*, and *nmar* 'breadfruit' has the compounding form *mor-*, and these roots yield such compounds as *nvat* 'stone' + *mah* 'die' > *vetmah* 'unused cooking stone', and *nmar* 'breadfruit' + *uki* 'kingfisher' > *moruki* 'kind of breadfruit', respectively. We seem to have here a clear case of an adequate diachronic account which explains a synchronic patterned irregularity, with no appeal to a synchronic derivational apparatus being employed. Or, to put it slightly differently, if one patterned irregularity (i.e., these reanalyzed Sye nominal stems with word-initial *n-*) can fall to amphichronic explanation, so too can another (i.e., Sye modified verb stem alternants).

To fully support a serial derivation analysis implementing intermediate representational forms, it would be ideal to show that such forms have actual effects on other aspects of the grammar (e.g. with opacity effects in reduplication). Frampton has not actually provided us with such evidence from the facts relevant to reduplication and verb stem alternations in Sye. So, we have not yet witnessed adequate empirical support requiring readjustment rules in the synchronic grammar.

4. Conclusion

In this paper we have reviewed the controversy surrounding the use of readjustment rules in DM. Such rules harken back to aspects of *SPE* theorizing which have been subject to criticism for decades. Although the importation of such rules into the morphology was seen as problematic from quarters outside of DM at its inception, DM-internal criticisms of this mechanism have

arisen only relatively recently. We have revisited in-depth studies attempting to make a case that DM needs such rules, but I have argued that reasonable explanations for phenomena like phonological regularities within stem classes can be found outside of synchronic grammar, particularly in language change and acquisition. Given strong conceptual arguments against readjustment rules, such rules should be held to a high burden of proof, in the form of adequate empirical data, if they are going to be incorporated into the theory. I have argued that such data would ideally demonstrate opacity-like effects explained by the emergence of intermediate representational forms, as is predicted to be possible by the serial derivational model of phonology.

Beyond DM, this discussion bears on morphological metatheory more broadly because the arguments provided here support some version of Bermúdez-Otero's (2012) strong *Morph Integrity Hypothesis*, which precludes the morphology operating directly on phonological representations. We've hardly settled the matter here, as far as this strong hypothesis is concerned, but I do hope to have demonstrated that the issues raised above in regard to readjustment rules ought to be taken into account in the formulation and evaluation of other morphological theories.

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