1. Introduction

In some languages, the phonology treats nouns differently from verbs and words of other category. For example, the language Shona places differing constraints on the tonal contours of nouns and verbs.

“The tone of a verb root is always associated with the first syllable of the verb stem…There is no lexical contrast in the position of tones in verb roots.” (Myers 1997; p. 858)

Although Shona has verbs such as “táris” see and “vereng” read, the imaginable verb roots “taris” and “vérêng” are not possible. Nevertheless, the noun inventory of Shona includes such roots as “badzá” hoe alongside the roots “bázi” branch and “bángá” knife.

Another example of such phonological noun-verb dissimilarities may be found in the language Trukese, as described in Goodenough and Sugita (1980, 1990). In Trukese, nouns have a bimoraic minimal size requirement that verbs seem to lack. If a Trukese noun is monosyllabic, it must have a long vowel. For example, the nominal root “fas” nest must, when occurring as a bare form, surface as “faas” 1. However, the verbal root “fan” run around may surface as the bare form “fan”, which contrasts in length with the monosyllabic verb “faan” break open.

A third instance of this phenomenon is visible in Itelmen, as described and analyzed in Bobaljik (1997). The phonology of Itelmen contains an epenthesis rule which is cyclic in verbs but acyclic in nouns. As Itelmen epenthesis will constitute the primary case-study for the view to be advanced in this paper, we shall expand later on the details of this alternation.

A fourth case of phonological noun-verb dissimilarity may be seen in classical Arabic. As discussed in Bobaljik 2002 and McCarthy 2002, nouns in classical Arabic are able to end in super-heavy syllables while verbs cannot. However, verbs can begin with consonant clusters while nouns cannot.

Cases of phonological noun-verb dissimilarities were first systematically studied in the work of Jennifer Smith (Smith 1997, 1999, 2001). Smith’s analysis of cases such as these postulates the existence of a class of so-called “N-Faith constraints”, which enforce extra faithfulness to the underlying forms of nouns. The intent of this analysis is to capture a generalization that nouns are subject to less phonological alterations – and so show more phonological contrasts – than verbs. However, the cases just discussed, particularly those of Trukese, Itelmen and classical Arabic, suggest that this generalization is incorrect. More

I would like to thank Feng-Fan Hsieh, Jennifer Smith, Donca Steriade and Cheryl Zoll for their many helpful and stimulating discussions regarding this work. I would also like to thank the MIT Phonology Circle and the attendees of the MIT IAP Workshop on Paradigm Structure for their valuable comments upon an earlier draft. Special thanks must be extended to Cheryl Zoll, who first brought this subject to my attention. This material is based upon work supported under a National Science Foundation Graduate Research Fellowship.

1 The shortness of the underlying vowel is witnessed by its appearance in compounds.
importantly, however, these cases raise a greater question, one which the “N-Faith” account does not address.

When faced with phonological noun-verb dissimilarities, we must ask why phonology seems to be sensitive to the syntactic category of its inputs. Is there some variety of architectural explanation for the fact that different sets of phonological generalizations sometimes cover nouns and verbs?

I will argue that surface phonological differences between nouns and verbs are epiphenomena. Contrary to appearances, phonology is not sensitive to the syntactic category of its input. Rather, any phonological differences between nouns and verbs are the result of prior, independently observable inflectional differences between nouns and verbs, combined with paradigm uniformity effects that hold across the language. To put the answer differently: yes, there is an architectural explanation for the phenomena above. The Optimal Paradigms architecture developed in McCarthy 2002 has as its consequence that inflectional differences between nouns and verbs can result in there being a different set of phonological generalizations which govern them.

The primary case-study for this hypothesis will be the phenomenon of schwa epenthesis in Itelmen.

2. Itelmen Epenthesis and Theories of Opacity

2.1 Cyclic and Acyclic Schwa Epenthesis in Itelmen

Schwa epenthesis in the language Itelmen is described and analyzed in Bobaljik (1997). Although (1) shows that Itelmen tolerates extensive consonant clusters, it also displays an interesting schwa-zero alternation in many of its nouns, witnessed in (2)\(^2\).

(1)  
/t+scNin/ = “you are carrying it”
/mskce/n/ = “I will make them”
/sit\l^kpe\s/ = “with embers”

(2)  
(iiia) /sp\l/ = “wind-nom/acc-sg”  
(iiib) /spl - ank/ = “wind-LOC”

Although this might, from these examples, appear to be due to a minimum size requirement on the nouns, Bobaljik convincingly argues that the alternation is due to Itelmen’s not permitting certain sequences of consonants. The rule of epenthesis operating in these examples is given as the following.

(3)  
∅ \rightarrow \leftrightarrow / \{C, \#\} __ R \{C, \#\}

The rule in (3) states that, within Itelmen nouns, a sonorant must have a vowel on at least one side of it, and a schwa is epenthized directly before any sonorant which does not satisfy

\(^2\) All Itelmen examples are taken from Bobaljik (1997) and Bobaljik & Wurmbrand (2003).
this condition \(^3\). This rule is descriptively correct for the Itelmen nouns Bobaljik discusses, but the main interest of Bobaljik (1997) is the way in which this rule gains additional support from the phonological behavior of Itelmen verbs.

Although there is no similar schwa-zero alternation in Itelmen verbs, the presence of schwa in verbs conforms to the rule stated above for nouns. That is, within Itelmen verbs, a sonorant is always adjacent to a vowel, and there are many verbs containing the sequences #↔RC, C↔RC, and C↔R#.

(4)  
(a) \(/t{-}z ↔ l\)-cen/ = “I gave it (to him)”  
(b) \(/s{p} ↔ l\)-qzu-in/ = “It was windy”

The examples in (4) suggest that Itelman verbs are also subject to the nominal epenthesis rule in (3); the problem is that verbs contain schwa in contexts not predicted by (3) alone.

(5)  
(a) \(/xan -z ↔ l\)-um/ = “she might give me (to him)”  
(b) \(/s{p} ↔ l\) - in/ = “it is windy”

In (5a) and (5b), we see that schwa appears before a sonorant, even when that sonorant is followed by a vowel.\(^4\)

Bobaljik (1997) argues that the distribution of schwa in Itelmen verbs – as well as their lack of #RC, CRC, and CR# sequences – can be understood if we suppose that the rule in (3) is acyclic in nouns, but cyclic in verbs. That is, the trigger of epenthesis in (5a) and (5b) is the environment “CR#,” which exists in the domain at which the rule is applied, namely the verbal root. This is illustrated in (6).

(6)  
INPUT  
[\[xan \[\[zl \] \] um \] \] \]  
[\[s{p}l \] in \] ]

Cycle 1
\[\[z ↔ l\] \]  
\[\[s{p} ↔ l\] \]

Cycle 2
\[\[z ↔ l\] \] um\]  
\[\[s{p} ↔ l\] in \] ]

Cycle 3
\[\[xan \[\[z ↔ l\] \] um\] \] \]  
----------

OUTPUT  
/ \[\[xan -z ↔ l\] \] - um/ \]  
/ \[\[s{p} ↔ l\] - in/ \]

Additional support for the cyclic nature of rule application in Itelmen verbs comes from the appearance of its present tense morpheme. The present tense suffix has four allomorphs: /↔z/, /↔s/, /z/ and /s/. The distribution of these allomorphs is illustrated below.

(7)  
(a) \(/t' - nu - s - kicen/ = “I am eating”\)  
(b) \(/nu - z - in/ = “He is eating”\)  
(c) \(/t' - il: - ↔ s - kicen/ = “I am drinking”\)  
(d) \(/il: - ↔ z - in/ = “he is drinking”\)

---

\(^3\) For those uncomfortable with the notion of /z/ being classified in certain languages as a sonorant, a nearly identical rule appealing to the feature of voicing would suffice for our discussion throughout.

\(^4\) The long /l/ in (5b) is the result of an intervocalic gemination, more generally visible in the language. Thus, the long /l/ must be triggered by the presence of the schwa, rather than the other way round.
The alternation between an allomorph containing a voiced or a voiceless consonant is one of regressive devoicing. If the present tense suffix precedes another suffix beginning in a voiceless consonant, then the consonant of the present tense suffix is voiceless. However, whether the suffix contains a schwa or not depends upon the form of the root it attaches to. If the root ends in a consonant, then the suffix contains the schwa; if the root ends in a vowel, then the suffix lacks the schwa.

Bobaljik (1997) points out that these features of the present tense morpheme are nicely explained by the cyclic model, if we suppose that the underlying form of the present tense is /z/.

As (8) illustrates, the distribution of schwa in the present tense morpheme follows from the cyclic rule of schwa epenthesis. For verb roots ending in a consonant, the epenthesis rule is triggered on the cycle at which the present tense suffix /z/ is attached, and so the suffix appears with a schwa. For verb roots ending in a vowel, the epenthesis rule is not triggered on this cycle, and so the suffix does not appear containing a schwa. Moreover, if the suffix is followed by a morpheme beginning in a voiceless consonant, we get a devoicing of the /z/ after the epenthesis rule has applied, either on the next cycle or post-cyclically.

2.2 The Significance of Itelmen for Theories of Opacity

This derivational analysis therefore views the presence of schwa in Itelmen verbs as the result of an opaque instance of the epenthesis process that can be observed transparently in nouns. Bobaljik (1997) aptly notes the challenges which the Itelmen data raise for contemporary accounts of opacity within the OT framework. Bobaljik (1997) demonstrates that these facts cannot be captured by the then-available methods for analyzing opacity within OT: Base-Identity constraints and Generalized Alignment. Furthermore, although Bobaljik (1997) does not discuss Sympathy Theory, we should observe that the opacity of Itelmen schwa-epenthesis cannot be easily accounted for via Sympathy alone. The problem is that for a Sympathy analysis to go through, one must first identify a failed candidate output L in which the process in question takes place transparently, and then identify a Faithfulness constraint F such that leaving F undominated would result in L being the winning candidate. Consider, however, the form /sp↔l↔z-in/, in which schwa epenthesis occurs opaquely twice. There seems to be no plausible ‘sympathy
candidate’ in which epenthesis occurs transparently twice. Now, one may perhaps hypothesize that these forms evince Sympathy to two independent sympathy candidates. However, since there is no principled bound on the number of opaquely epenthesized schwas in Itelmen verbs, this is clearly not the right way to think about these facts.

Although Bobaljik’s cyclic analysis of Itelmen fares better than these parallelist competitors, there is one aspect of the Itelmen facts which is not so easily accounted for in a derivational framework. In order to account for the distribution of schwa in both nouns and verbs, the analysis must stipulate that certain phonological rules are evaluated cyclically in verbs but acyclically in nouns. But, why should that be so? First, why should the cyclic nature of a rule be sensitive to the syntactic category of the word to which it is applying? Second, why should verbs cause this rule to be cyclic while nouns should be subject to it acyclically?

A similar question arises for the analysis presented in Bobaljik (2002) of the phonological noun-verb dissimilarity described in section 1 for classical Arabic (CA). As reported by McCarthy (2002), Bobaljik (2002) explains the differences between the syllable shapes available to CA nouns and verbs in terms of the phonological cycle. Specifically, it is claimed that the difference is due to certain rules being cyclic in CA verbs but acyclic in CA nouns. McCarthy 2002, however, provides an analysis of CA morphology which does not rely on such a stipulation. Rather, McCarthy shows that, within his framework of Optimal Paradigms (OP), this dissimilarity between the shape of nominal and verbal roots may be reduced to a prior dissimilarity between the shape of nominal and verbal inflection. Given an observable, independent phonological difference between nominal and verbal inflection, certain constraints governing the forms of CA paradigms can derive the differences between the possible shapes of CA noun roots and verb roots.

This, of course, raises an obvious question: can OP account for the Itelmen data? We will see that it can. Furthermore, the opacity witnessed in Itelmen verbs is precisely the sort of opacity which OP expects to see across languages. Before we can discuss this result, however, I must first properly introduce the OP system.

3. Optimal Paradigms: A Quick Exposition

Optimal Paradigms (McCarthy 2002) is one means of implementing the concept of “paradigm uniformity” within a parallelist, constraint-based model of phonology. Many analysts working within OT have proposed the existence of constraints requiring that the morphological paradigms of a language be, in some sense, “uniform” (Kenstowicz 1997, Kiparsky 1998). Optimal Paradigms provides a particularly clear and precise formulation of such constraints. It differs from standard OT in the following respects.

1. “Candidates consist of entire inflectional paradigms, where an inflectional paradigm contains all and only the words based on a single lexeme” (McCarthy 2002).

2. “Markedness and input-output faithfulness constraints evaluate all members of the candidate paradigm. The violation-marks incurred by each paradigm member are added to those incurred by all the others” (McCarthy 2002).
3. “The stem (output form of the shared lexeme) in each paradigm member is in a correspondence relation $R_{OP}$ with the stem in every other paradigm member” (McCarthy 2002).

In a sense, then, OP extends the “base-identity” correspondence relation used in OT accounts of opacity induced by derivational morphology (Benua 1997) so that it holds between every form within a paradigm. As a result, the very notion of a “base” within the inflectional component is gone, and each paradigm member influences the others equally.

In addition, I will extend this intraparadigmatic faithfulness relation $R_{OP}$ to all identifiable morphemes appearing in the paradigm members. That is, for every morpheme $m$ appearing in a paradigm member, there is a correspondence relation $R_{OP}$ holding between $m$ and every other appearance of $m$ within the candidate paradigm ⁵. This will play an important role in our theory of Itelmen verbal morphology.

4. “There is a set of output-output faithfulness constraints on the $R_{OP}$ correspondence relation” (McCarthy 2002). We will notate these constraints with the prefix “OP”. Thus, a constraint of the Max family holding over the relation $R_{OP}$ will be written OP-Max ⁶.

I refer the reader to McCarthy (2002) for a richer discussion and exposition of the framework.

At least part of the interest in OP stems from the rather restrictive theory of Paradigm Uniformity effects that it entails. For example, OP predicts that Paradigm Uniformity effects will be essentially “over-applicative” in nature. That is, in order to preserve uniformity within its paradigms, a language’s “first choice” is to systematically apply a process in environments where it is not phonotactically motivated, rather than suppress that process where it is so motivated.

This prediction of OP follows from the basic logic of OT constraint interaction. Within OP, Paradigm Uniformity effects are only visible when an OP-Faithfulness constraint $OP$
outranks an IO-Faithfulness constraint IO that, in turn, is dominated by a Markedness constraint M. The problem is that M will always decide in favor of those candidate paradigms in which the surface property he forbids appears least. Therefore, if given a choice between a uniform paradigm in which the process that M enforces is overapplied – that is, applies where it warranted and thensome – and a uniform paradigm in which the process is underapplied – that is, applies nowhere, not even in the cases where it is warranted – M will always decide in favor of the overapplication candidate. Thus, for the underapplication candidate to be optimal, there must be some constraint C, ranked higher than M, which eliminates all the overapplication candidates. OP predicts, then, that underapplication of a process within a paradigm only happens in cases where all overapplication is blocked. See McCarthy 2002 for an extended discussion of this point.

This prediction of OP immediately brings to mind the Itelmen data. In Itelmen, recall, we were puzzled by a *prima facie* case of overapplication: in verbs the epenthesis rule seems to apply in environments where it is not motivated on the surface. In the next section, we will see that these phenomena can be easily understood as an instance of OP Paradigm Uniformity. Moreover, we will find that an independently observable feature of Itelmen nominal morphology might explain why such an overapplication of schwa-epenthesis should occur *only* in verbs.

### 4. Itelmen within Optimal Paradigms

#### 4.1 Itelmen Verbs

As described and analyzed in Bobaljik and Wurmbrand 2003, Itelmen verbal inflectional morphology is ponderously rich, incorporating a subtle and complex system of subject and object agreement. An inflectional paradigm for a single verb in Itelmen can contain over one hundred different forms. From an OP point of view, it therefore becomes eminently plausible that opaque schwa-epenthesis in Itelmen is an instance of overapplication. Thus, the view I will pursue is that, contrary to the cyclic analysis, the opaque vowel epenthesis of /sp↔l:-in/ doesn’t occur transparently in a subconstituent of the word, but in a related paradigm member, /sp↔l-qzu-in/.

A highly ranked OP-Max-V then passes the transparently epenthesized schwa over to all other members of the verb’s paradigm.

Let us begin spelling this idea out concretely. We suppose that schwa-epenthesis in Itelmen is the result of the constraint IO-Dep-V being outranked by some constraint complex banning the sequences \{C, #\} R \{C, #\}; for our purposes we simply appeal to a constraint “Son-Support!” which is violated by exactly those sequences. Moreover, we suppose that OP-Max-V outranks Son-Support!. The constraint ranking for Itelmen is therefore: OP-Max(V) >> Son-Support! >> IO-Dep(V)

Recall, now, that the verb roots /spl/ and /zl/ have inflected forms in which the schwa-epenthesis takes place transparently; these are given in (4a) and (4b). This single instance of transparent epenthesis is enough to pass the epenthesized scwha “opaquely” over to all other members of the verbal paradigm, as the tableaux (9) and (10) reveal.

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7 With any other configuration, the result is either (i) the “process” enforced by the Markedness constraint does not take place (IO >> M), or (ii) Faithfulness to one’s own input form prevails over Faithfulness to one’s paradigm companions (IO >> OP).
(9)

<table>
<thead>
<tr>
<th>[spl]_V</th>
<th>OP-Max(V)</th>
<th>Son-Support!</th>
<th>IO-Dep(V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>{sp ↔ l-in, sp ↔ l-qzu-in ...}</td>
<td></td>
<td>* *</td>
<td></td>
</tr>
<tr>
<td>{spl-in, sp ↔ l-qzu-in...}</td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>{spl-in, spl-qzu-in...}</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

(10)

<table>
<thead>
<tr>
<th>[zl]_V</th>
<th>OP-Max(V)</th>
<th>Son-Support!</th>
<th>IO-Dep(V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>{t-z ↔ l-cen, xan-z ↔ l-um ...}</td>
<td></td>
<td>* *</td>
<td></td>
</tr>
<tr>
<td>{t-z ↔ l-cen, xan-zl-um...}</td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>{t-zl-cen, xan-zl-um...}</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

In both these tableaux, the same pattern of optimization takes place. The second candidate, in which schwa-epenthesis only occurs transparently, violates the highly ranked OP-Max(V), which forbids vowel-zero alternations within a paradigm. The third candidate, the underapplication candidate, is eliminated by the Markedness constraint Son-Support!. This leaves the first candidate, the overapplication candidate, as optimal. Note that none of the other +100 inflected forms of these verbal roots need be consulted to secure the validity of this argument; one is sufficient.
We see, then, that OP on its own can account for the cyclic character of schwa-epenthesis in Itelmen verbs. However, our story becomes a bit more complicated when we consider the interaction of schwa-epenthesis with the devoicing of /z/ in the present tense suffix. Consider the following tableau.

(11)

<table>
<thead>
<tr>
<th>[il]V</th>
<th>OP-Max(V)</th>
<th>Son-Support!</th>
<th>IO-Dep(V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>{il:-↔z-in, t-il:-↔s-kicen, …}</td>
<td></td>
<td>* ! *</td>
<td></td>
</tr>
<tr>
<td>{il:-z-in, t-il:-↔s-kicen, …}</td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>{il:-z-in, t-il:-s-kicen, …}</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We incorrectly predict the suboptimal, underapplication paradigm \{il:-z-in, t-il:-s-kicen\} to be the winner. In brief, the problem is that we have failed to account for all aspects of the opacity of Itelmen schwa-epenthesis. OP-Faith accounts for why schwa-epenthesis is occasioned before vowels at a morpheme boundary; something else must account for why schwa-epenthesis is occasioned before the voiceless present tense morpheme.

Recall that the derivational analysis posits extrinsic rule-ordering as the additional component accounting for schwa-epenthesis before the voiceless allomorph of the present tense. In the OT account, therefore, this additional component could quite easily be Sympathy. After all, Sympathy-induced opacity and paradigm uniformity effects are independently observable phenomena in language. We might, then, expect to find languages in which they interact. Note, moreover, that our positing the effects of Sympathy in conjunction with the effects of OP-Faith to account for the Itelmen data are very much akin to the derivational theory’s positing the conjoined effects of cyclicity and rule-ordering to cover these facts. Again, we find an instance of the analogy “cyclicity : O-O constraints :: rule-ordering : Sympathy.”

The Sympathy Theoretic account of the Itelmen present tense suffix would run as follows. We posit that in Itelmen we have active the constraint *[voi]-[voi], which assigns a violation mark for every voiced consonant followed by a voiceless. This constraint outranks the
constraint “IO-Ident(voi)”

However, “IO-Ident(voi)” is a selector constraint for Itelmen. Finally, we suppose that the Sympathy constraint “●O-Max(V)” is undominated in Itelmen.

The following tableau demonstrates that this analysis would make the correct predictions regarding epenthesis in the present tense suffix.

(12)

<table>
<thead>
<tr>
<th>[il]V</th>
<th>●O-Max(V)</th>
<th>OP-Max(V)</th>
<th>*[voi][-voi]</th>
<th>Son-Supp!</th>
<th>IO-Dep(V)</th>
<th>●IO-Ident(voi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>{il:-●z-in,</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-il:-●s-kicen, …}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{il:-z-in</td>
<td>*!</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-il:-●s-kicen, …}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{il:-z-in</td>
<td>*!</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-il:-s-kicen, …}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● {il:-●z-in,</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td>●●</td>
</tr>
<tr>
<td>t-il:-●z-kicen, …}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{il:-z-in</td>
<td>*!</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
<td>●●</td>
</tr>
<tr>
<td>t-il:-●z-kicen, …}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{il:-z-in</td>
<td>*!</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td>●●</td>
</tr>
<tr>
<td>t-il:-z-kicen, …}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{il:-●s-in,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td>●●</td>
</tr>
<tr>
<td>t-il:-●s-kicen, …}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{il:-s-in</td>
<td>*!</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td>●●</td>
</tr>
<tr>
<td>t-il:-●s-kicen, …}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{il:-s-in</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>●●</td>
</tr>
<tr>
<td>t-il:-s-kicen, …}</td>
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</tr>
</tbody>
</table>

8 I am, of course, skirting by the question of why this voicing assimilation is regressive. I assume that this aspect of the analysis does not depend upon an answer to that question.
The pattern of optimization in (12) is complex, but straightforward. The activity of “IO-Ident(voice)” as a selector constraint entails that the output form must be faithful to a form in which there is never a change in the voicing of underlying /z/. More specifically, the undominated status of “•O-Max(V)” entails that output must contain all the vowels contained within the most optimal of the candidates fully satisfying “IO-Ident(voice)”.

4.2 Itelmen Nouns

We see, then, that phonological theory needn’t make use of a derivation to account for the properties of Itelmen. But, do we really gain anything extra from the OP analysis of Itelmen schwa-epenthesis? In fact, we do. As opposed to the derivational analysis, which relies on a stipulated difference between nouns and verbs, the OP account might relate the transparency of schwa-epenthesis in nominal forms to a rather salient feature of their inflection. Notice that when we look to the examples in (2), we see that for nouns there is something of an independent base for their affixed forms. The nominative / accusative singular forms of a nominal root undergo no affixation (Bobaljik and Wurmbrand 2003). Thus, their underlying phonological form is entirely contained within the phonological realizations of the oblique and plural forms of the root. This is, importantly, never the case for Itelmen verbs; there is no word containing an Itelmen verbal root whose underlying phonological representation is contained within the phonological representations of all other forms containing the root (Bobaljik 1997, Bobaljik and Wurmbrand 2003).

Why should this matter? McCarthy 2002 sometimes in its discussion conflates two very different concepts: a set of morphologically related forms lacking an independent base, and a set of morphologically related forms exemplifying a paradigm. Suppose that the OP theory of paradigm uniformity effects is correct in that such effects are due to there being a symmetric correspondence relation holding between related forms lacking a base. However, suppose that it is incorrect in the presumption that such sets of forms need correspond to the paradigms of the language, should such objects truly exist. That is, contrary to the name, “paradigm uniformity effects” are not the result of languages attempting to keep their ‘paradigms’ phonologically uniform. Instead, whenever the set words containing a given root lacks an independent base, the O-O relation holding between them “goes symmetric”. Since a privileged member of the set cannot be found, all forms come to influence one another equally. On the other hand, if a base for the set can be found – a word whose phonology forms a part of all other forms in the set – the correspondence relation is the asymmetric Base-Identity relation, facilitating base-derivative correspondence.

Let us make this idea more precise. I propose the following changes to the standard OP architecture:

1. For every root w, the morphology generates the set $W_{\text{par}}$ of all the underlying forms containing w (whether or not they be derived by “inflectional” or “derivational” morphology).

2. The function GEN takes $W_{\text{par}}$ as input, and generates an infinite set of sets, each a candidate realization of $W_{\text{par}}$. We’ll write $W_{\text{cand}}$ to mean one such candidate realization. Moreover, for any x in $W_{\text{par}}$ and any candidate $W_{\text{cand}}$, $x_{\text{cand}}$ is the corresponding candidate surface form of x in $W_{\text{cand}}$. 

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3. If there exists a member x of $W_{par}$ which is a substring of every other member of $W_{par}$, then for every candidate $W_{cand}$ the asymmetric correspondence relation $R_{BI}$ holds between $x_{cand}$ and every other member of $W_{cand}$.

4. If no such x exists, then for every candidate $W_{cand}$, the symmetric correspondence relation $R_{OP}$ holds between every member of $W_{cand}$.

In other words, to determine whether the members of the candidate realizations of an underlying ‘paradigm’ $W_{par}$ – generated from a root w by the morphology – are related by symmetric $R_{OP}$ or asymmetric $R_{BI}$, the phonology looks to the contents of $W_{par}$. If there is a “base” within that set, a member contained within all the other members, then the intra-paradigmatic correspondence relation for all the candidate realizations of $W_{par}$ is $R_{BI}$. That is, for every candidate realization $W_{cand}$ of $W_{par}$, the relation $R_{BI}$ holds between the correspondent $x_{cand}$ of the “base” x within $W_{cand}$ and all the other members of $W_{cand}$. If no such base is found, then the intra-paradigmatic correspondence relation for the candidate realizations is the symmetric $R_{OP}$. That is, for every candidate realization $W_{cand}$ of $W_{par}$, the symmetric relation $R_{OP}$ holds between all the members of $W_{cand}$.

In still simpler terms, if our input underlying ‘paradigm’ $W_{par}$ is such that it contains an identifiable base x for all its other members, then in all the candidate realizations of $W_{par}$, the correspondent of x must bear the “base-derivative” correspondence relation to the correspondents of all the other members of $W_{par}$. The “basey-ness” of x in $W_{par}$ must be maintained in all the candidate realizations of $W_{par}$. However, if our input underlying ‘paradigm’ doesn’t have such an identifiable base, then in all its candidate realizations the individual members must bear the symmetric “paradigm-uniformity” correspondence relation to one another.

I therefore propose that OP become a general theory of O-O correspondences, encompassing both base-identity effects and paradigm-uniformity effects. Base-identity effects arise when the input word-set contains an identifiable base; paradigm-uniformity effects arise when it lacks such a base. The term ‘paradigm uniformity effect’ thereby becomes a misnomer, given that these input word-sets needn’t correspond to the ‘paradigm’ for a particular root, but rather the entire set of words containing the root. Moreover, whether the special, symmetric OP-correspondence relation holds between the members of that set depends not on whether they are derived from the root by derivational or inflectional morphology, but on whether the input word-set has a certain holistic, phonological property.

Whether this is ultimately a productive hypothesis for the theory of base-identity and paradigm uniformity effects is not altogether clear. However, it could make sense of the difference between schwa epenthesis in Itelmen nouns and verbs. Since the input word-set for an Itelman nominal root has a base – the underlying form of the nominative/accusative singular – the correspondence relation holding between the members of the candidate sets is the asymmetric $R_{BI}$. Moreover, since the input word-set for an Itelmen verbal root lacks such a base, the correspondence relation holding between the members of the candidate sets is the symmetric $R_{OP}$. Finally, let us hypothesize that in Itelmen the constraint BI-Max(V) is ranked below IO-Dep(V).

These additions to our Itelmen grammar will not upset our previous analysis of opaque schwa-epenthesis in Vs. Furthermore, as the tableau in (13) demonstrates, we now predict schwa-epenthesis to be transparent in Itelmen nouns.
None of the candidate sets violate OP-Max(V), since the relation $R_{OP}$ does not hold between the members of the candidates. The second candidate, in which no epenthesis takes place in any of its members, violates the highly ranked $R$-Support!. The third candidate, in which schwa-epenthesis takes place opaquely in some of its members, incurs extraneous violations of IO-Dep(V). Thus, the first candidate, in which epenthesis takes place only transparently, surfaces as the optimal “paradigm.”

We find, then, that the conceptual apparatus of OP could both (i) explain the opacity of schwa-epenthesis in Itelmen verbs, and (ii) explain why schwa-epenthesis lacks this opacity in Itelmen nouns. Since the derivational analysis of Itelmen only accomplishes (i), I conclude that OP provides a more interesting theory of Itelmen schwa epenthesis. While the derivational analysis leaves us with a stipulation, the OP analysis allows us to begin construction of a theory.

Of course, our OP analysis of Itelmen requires us to substantively change our theory of paradigm uniformity effects. Such effects can no longer be taken as evidence for the status of “paradigms” as objects of linguistic representation. Instead, they are at most possibly evidence that the set of words containing a root is linguistically represented. However, such a set needn’t have the kind of internal structure and dimensionality that the concept ‘paradigm’ entails.

5. OP Analyses of N-V Dissimilarities in Other Languages

We now see from the examples of Itelmen and Classical Arabic how the OP architecture can explain, for two particular languages, why verbal and nominal expressions in those languages might appear to satisfy different phonological generalizations. Now, one might induce from these cases a general theory of phonological dissimilarities between nouns and verbs. For both Itelmen and Arabic OP explains a phonological N-V dissimilarity as arising from a more
fundamental difference in inflectional morphology. This, of course, inspires the hypothesis in (14).

(14) **The Paradigmatic Basis of N-V Dissimilarities**
For all languages L, if the phonology of L seems to treat nouns and verbs differently, this is the result of there being in L (i) an active paradigm uniformity effect and (ii) an inflectional difference between nouns and verbs.

This is a challenging hypothesis to maintain, and is probably too strong. There are many languages which show a phonological dissimilarity between nouns and verbs. However, I will argue that at least the cases mentioned at the beginning of our discussion might be consistent with hypothesis (14). Furthermore, this hypothesis correctly predicts a generalization that is not accounted for under alternative theories of N-V dissimilarity, such as the theory of N-Faithfulness. Smith 2001 observes that in languages showing a N-V dissimilarity, the phonology will treat adjectives according to the category which they inflect like. For example, in a language where adjectives inflect like nouns, the adjectives will show the phonological contrasts witnessed in nouns. In a language where adjectives inflect like verbs, however, the adjectives show the phonological profile of verbs. This pattern is nicely explained in OP, where the phonological behavior of nouns and verbs is dependent upon their inflectional paradigm. Thus, if adjectives have the same inflectional paradigm as nouns, OP would predict that adjectives and nouns should be subject to the exact same phonological processes. The same is true if adjectives inflect like verbs. N-Faith does not, as of yet, have a principled explanation for this chimerical behavior of adjectives. Moreover, one can see that this fact would be difficult to capture within a phonological architecture which is directly sensitive to the syntactic category of its inputs.

I will close by showing how both the Shona and the Trukese data can be viewed as resulting from paradigm uniformity effects. However, I should immediately state that these are very programmatic arguments and examples. Moreover, the Trukese data stand as possible counter-evidence to the OP theory of paradigm uniformity effects, as well as create problems for our analysis of Itelmen.

### 5.1 Shona

The following analysis of the Shona facts remains rather hypothetical, since it rests on a morphological assumption about Shona which I have not yet been able to prove or disprove, for simple reasons of lack of resources. What this does show, however, is how a promising OP line of attack is essentially lying in clear view.

Recall the Shona facts:

*The tone of a verb root is always associated with the first syllable of the verb stem...There is no lexical contrast in the position of tones in verb roots. (Myers 1997; p. 858)*

Interestingly, the OT ranking proposed for Shona in Myers (1997) predicts that if a root with a H-tone associated with just its final syllable were to precede a suffix with an initial H-tone, the

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9 Why rule out explanations of phonological N-V dissimilarities appealing to neither phonological sensitivity to syntactic input nor paradigm uniformity effects?
root’s H-tone would shift to its initial syllable. Moreover, this ranking predicts that if a root with a H-tone associated with both its final and its initial syllable were to precede a suffix with an initial H-tone, the association line connecting the root’s final syllable to the H-tone would be severed. Such shifting and cutting of tones isn’t witnessed in the data Myers considers, since that data contains no instances of verbal suffixes with initial H-tones nor any instances of nominal suffixes. Nevertheless, such patterns are a predicted consequence of his grammar.

(15) **Predicted Shona Tone Shifts**

\[
\text{[banga’] + [ti’] = [ba’nga-ti’]}
\]

\[
\text{[ba’nga’] + [ti’] = [ba’nga-ti’]}
\]

Now, suppose that there does exist a verbal suffix in Shona which has a H-tone associated with its initial syllable. Moreover, suppose that OP-Ident(Tone) is undominated in Shona. The result will be that any candidate paradigms in which any paradigm members differ in tone will be ruled out by the OP-Ident(Tone), and that any paradigm members in which the tone-shifts illustrated above are warranted but don’t occur will be ruled out by the rest of Myers’ constraint ranking. Thus, for a hypothetical verbal input with a H-tone on its final syllable, the only optimal outputs will be paradigms in which one of the two tone shifts applies in the paradigm member in which it is motivated – the one in which the verbal root precedes the suffix with the initial H – and is then passed around to all the other paradigm members via OP-Ident(tone). The effect will be that the association of H-tone on the final syllable of the root becomes “occulted”.

In short, one reason why there are no verbal roots in Shona with H-tones on their final syllables may be that any such roots would, due to the constraint ranking argued for by Myers and a paradigm uniformity effect, appear on the surface no different from a root without a syllable final H-tone.

I tentatively conclude that Shona could support the OP theory of Paradigm Uniformity effects, as well as hypothesis (14). The final language I will consider, however, raises problems for OP and possibly our analysis of Itelmen, though it might stand as another case in support of hypothesis (14).

**5.2 Trukese**

Recall the strange lengthening alternation affecting Trukese nouns:

* Nouns have a bimoraic minimal size requirement that verbs seem to lack. If a Trukese noun is monosyllabic, it must have a long vowel. This condition does not hold for monosyllabic verbs.

Now, another unique property of verbs in Trukese is that they inflect (Goodenough and Sugita 1980, 1990). Although nouns appear in compounds and have some “genitive morphology,” there is no overtly realized structural case, gender, number or agreement. Verbs, however do inflect to an extent: object agreement is marked on the verb when the object is definite. I take object agreement to be a hallmark of inflection.
Perhaps there is no vowel-lengthening in Trukese monosyllabic verbs because a paradigm uniformity effect requires the bare form to remain faithful to the inflected form. Thus, the ultimate difference between nouns and verbs in Trukese is that only verbs are subject to a Paradigm Uniformity-induced case of underapplication.

Although this perspective upon the Trukese facts is in conformity with hypothesis (14), it raises problems for the OP theory of Paradigm Uniformity effects. The difficulty is that if the OP account is correct, then underapplication of the V-lengthening process in Trukese must be due to a higher ranked constraint C blocking the overapplication candidate. That is, the Trukese grammar must be something like the following:

(16)  
```
OP-Dep-V  C
  |     |
  v     v
MinWd   IO-Dep-V  *V:
```

The challenge is to identify the constraint C which prevents the overapplication candidate from surfacing. Note that C cannot be a markedness constraint against long vowels, since lengthening of the vowel is the repair triggered by violations of the MinWd constraint. For the same reason, C cannot be an IO-Faithfulness constraint against V-lengthening. Thus, to the extent that an appropriate C cannot be found, it seems that Trukese is a real counterexample to OP’s prediction that PU-effects are of an “overapplication first” variety.

6. Conclusion

We have seen that one needn’t posit a phonological architecture which is directly sensitive to the syntactic category of its inputs to explain the fact that nouns and verbs in many languages obey different sets of phonological generalizations. Moreover, if we analyze these phonological differences between nouns and verbs as the result of Paradigm Uniformity effects, we gain a great deal of insight into the particular form of these differences. Furthermore, we gain a principled account of the fact that whether a category obeys the generalizations that govern Ns or the generalizations that govern verbs depends upon whether that category inflects like a N or inflects like a V.

\(^{10}\) Note that this programmatic hypothesis is inconsistent with the theory of paradigm uniformity effects offered in our discussion of Itelmen.
References


