Anticorrespondence in Yidiɲ

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Abstract

Detailed study of data in Dixon's (1977) grammar indicates that previous analyses of Yidiɲ have erred in supposing that the synchronic pattern of the language continues the historical pattern, whereby various nominal stems have their underlying final vowels deleted when no suffix follows. Instead, it appears that the system has undergone a radical reanalysis, whereby the suffixed forms are now projectable by general principles from the isolation forms. More precisely, a pattern of **multiple predictability** has developed: the form of suffixed allomorphs is largely predictable from the isolation allomorphs, but the older pattern, whereby isolation allomorphs can be predicted from the suffixed allomorphs, also persists.

From this descriptive result, two principal theoretical consequences are developed: (a) Yidiɲ possesses a fully-productive pattern of alternation that is not driven by phonotactic constraints; (b) there are more relations of predictability among surface forms in Yidiɲ than can be treated by the normal method, namely that of deriving all the surface allomorphs from a single underlying representation.

To develop an analysis compatible with these findings, two devices are invoked. First, it is suggested that the theoretical arsenal of Optimality Theory should be expanded to include "Anticorrespondence" constraints, which actively require alternation. They do so by specifying string mappings between the allomorphs of morphemes as they occur in various contexts. Second, I suggest tentatively that the underlying representation be abandoned as the means of characterizing cross-paradigm similarity, to be replaced by a combination of Paradigm Uniformity and Anticorrespondence constraints. Using these devices, an explicit analysis for Yidiɲ is proposed and tested.

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1. Introduction: Automatic and Nonautomatic Alternation

I will define "automatic alternation" as variation in the shape of a morpheme that is needed in order to obey phonotactic principles. For example, the English past tense morpheme, whose default realization appears to be /-d/, alternates in voicing in order to obey a phonotactic requiring uniform voicing in final obstruent clusters, as in *jumped* [dʒʌmpt]; *[dʒʌmp**d**] would be simply unpronounceable in English.

A central virtue of Optimality Theory (Prince and Smolensky 1993) is that it treats cases of automatic alternation with great generality; without having to duplicate the phonotactic principle as part of a phonological rule that enforces alternation. Rather, we need only specify what is *allowed* to alternate (in this case, voicing in affix obstruents), and let the basic mechanisms of GEN and constraint-governed candidate selection derive the alternation.

What, then, of *non*-automatic alternation? As anyone who looks at grammars knows, such alternation does in fact occur; morphemes frequently alternate under conditions such that *even if the morpheme didn't alternate, the result would still conform to the phonotactic canons of the language.* This fact is often obscured to phonologists undergoing their first-year training, since it is a common practice to design phonology problem sets to make a non-automatic alternation look as if it were automatic.[2]

In some non-automatic alternations, the non-automaticity is due to a small number of exceptional forms, which are often of foreign origin and may indeed be perceived as such by native speakers. Such cases invite treatments that still derive the alternations from phonotactic constraints, as in the theory of vocabulary strata outlined by Ito and Mester (forthcoming) and the theory of exceptionality proposed by Pater (ms.).

The case I will discuss in this article is of a quite different character, involving a demonstrably productive phonological alternation, within the core vocabulary, that receives utterly no justification from the phonotactics of the language. To treat this alternation, I will propose a particular formal device, the **Anticorrespondence constraint**. This is, essentially, a

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[1] I would like to thank René Kager, Donca Steriade, and the participants in a UCLA seminar on Correspondence Constraints for helpful input on this research project.

[2] Thus, to cite two beautiful problems from Kenstowicz and Kisseberth (1979; 74-75, 328): Serbo-Croatian rather freely tolerates syllable-final /l/ (Bochner 1981), and Catalan tolerates word-final /r/, even where not derived from /rt/ (Mascaró 1978). I myself have shamelessly oversimplified the data of Yidiɲ when making a problem set out of it.

requirement that a morpheme alternate in a particular way. The proposal resumes an earlier line of research on the topic of "rule inversion," notably Vennemann (1972), Schuh (1972), Hale (1973), and Kenstowicz and Kisseberth (1977). Further, we will see that the Yidiɲ facts have some bearing on the important issue of whether the phonological relationships among the members of a paradigm are appropriately obtained by deriving them all from a common underlying representation. I tentatively suggest a negative answer, and analyze on that basis.

2. Yidiɲ

My example comes from the phonology of Yidiɲ, an Australian aboriginal language of North Queensland. Yidiɲ phonology was worked out with considerable insight by R. M. W. Dixon (1977), in a intensively detailed description based on work with several of the last native speakers of the language. Dixon's data and generalizations have proven irresistible to metrical stress theorists, all of whom have attempted to connect Yidiɲ metrical structure with particular versions of metrical stress theory.[3]

The interest here lies not in the metrical structures of Yidiɲ per se, but rather in the complex patterns (partly metrically governed) that are found throughout the Yidiɲ nominal and verbal paradigms. Almost every Yidiɲ stem shows alternations of vowel length, and many stems show vowel-zero alternations as well.

Since the analysis of these alternations is a contentious matter, I will first review the data from what I take to be a relatively pretheoretical viewpoint, namely the historical one. The line taken here is this: "Historical change created a Yidiɲ lexicon with the following data patterns; how did new generations of Yidiɲ learners deal with this pattern?"

2.1 Historical Yidiɲ

The dramatic phonological alternations of Yidiɲ are largely the product of two historical changes. One of them is characterized by Dixon (p. 43) as follows:

(1) **Penultimate Lengthening**

In every word with an odd number of syllables, the penultimate vowel is lengthened.

Penultimate Lengthening resulted in a huge number of synchronic alternations. For example (D 43), the underlying stem for 'mother', /mud^{j}am/, shows up unaltered as [mud^{j}am] in the absolutive case, where no suffix is added. With the addition of the Purposive ending [-gu], the

[3] See Nash (1979), Hayes (1980, 1982, 1995a), Halle and Vergnaud (1987), Kirchner (1993), Crowhurst and Hewitt (1995), and further references cited by Crowhurst and Hewitt.

form becomes trisyllabic (odd-syllabled), and Penultimate Lengthening applies, yielding [mudʲ**aː**mgu]. The trisyllabic stem for 'dog', historically *[gudaga], shows up as [gud**aː**ga] in the absolutive case, since it is trisyllabic. But when the purposive suffix [-gu] is added to it, the form becomes even-syllabled, and therefore Penultimate Lengthening did not affect it: [gud**a**ga-gu]. A quadrisyllabic stem, [ŋunaŋgara] 'whale' (D. 84) was unaltered in the absolutive, but received penultimate length in (for example) the dative, where a suffix renders the form pentasyllabic: [ŋunaŋgar**aː**-nda].

Naturally, one senses that there should be some connection between the interesting environment "penult of an odd-syllabled word" and the alternating stress pattern of Yidiɲ, laid out elsewhere in Dixon's grammar (D 40-41). This is one goal of the many metrical accounts of Yidiɲ phonology; within certain limits, the particular approach invoked is not particularly important here.

The pattern expressed by Penultimate Lengthening continues to be highly productive in synchronic Yidiɲ, and is virtually exceptionless on the surface.[4]

The other major phonological change that created modern Yidiɲ was as follows:

(2) **Final Syllable Deletion**

In a word ending in C_1 (C_2) V, delete C_2 and V, if:

a. The form that results ends in a legal word-final consonant (/l,r,ɽ,y,m,n,ɲ,ŋ/)
b. The form that results possesses an even number of syllables.

As one might expect, Final Syllable Deletion led to numerous phonological alternations, many of which persist into the synchronic state which Dixon describes. For example (D 45), if one takes the bare stem [buɲa] 'woman' and adds the basic postvocalic form of the ergative suffix [-ŋgu], one obtains [buɲaːŋ], which may be presumed to have been historically *[buɲaːŋgu] (and somewhat earlier, *[buɲaŋgu]). Similarly, the quadrisyllabic form [ŋunaŋgara] 'whale-absolutive' shows up in the ergative as [ŋunaŋgaraː-ŋ] (D 84), historically *[ŋunaŋgara-ŋgu]. The ergative ending can be seen in its unaltered historical form after a trisyllabic stem, e.g. in [mulari-ŋgu] 'initiated man-erg.' D 57.

[4] The exceptions concern the sporadic phenomenon of Stress Retraction (D 102-103), which continues to defy analysis from any perspective. For discussion of the exceptions involving the ablative-causal affix [-mu], which I regard as only apparent, see section 13.

It can be seen that Final Syllable Deletion, taken as a sound change, must have occurred after (or perhaps, contemporaneously with) Penultimate Lengthening, since in [buɲaːŋ] and countless similar words, what was historically the penultimate vowel shows up as long. Indeed, Dixon's synchronic analysis recapitulates the historical ordering with an identical synchronic ordering, placing Penultimate Lengthening first.

As a result of Final Syllable Deletion, a number of Yidiɲ suffixes have two dramatically different allomorphs, as was just shown for ergative [-ŋgu]/[-ːŋ]; see also (3) below. Moreover, roots also alternate by Final Syllable Deletion. For example, the stem meaning 'moon' shows up as trisyllabic when suffixed: [gindanu-ŋgu] 'moon-erg.' D 57, since quadrisyllables never underwent Final Syllable Deletion. But alone, 'moon' was trisyllabic, and thus underwent Penultimate Lengthening and Final Syllable Deletion to yield modern Yidiɲ [gindaːn].

Unlike Penultimate Lengthening, Final Syllable Deletion has not left a clean, across-the-board data pattern in contemporary Yidiɲ. Rather, there are many exceptions. These arose perhaps as analogical restorations, or perhaps the original process was lexically irregular in the first place.

Among the suffixes, we find that the majority of forms that could in principle alternate actually do ((3a)). Exceptions, however, are non-negligible ((3b)).

(3)a. **Suffixes which do alternate by Final Syllable Deletion**

[-ŋgu] ~ [-ːŋ]	ergative
[-ɲa] ~ [-ːɲ]	accusative
[-yi] ~ [-ːy]	nominal comitative
[-ɲu] ~ [-ːɲ]	past ([-n-] conjugation)
[-l-ɲu] ~ [-ːl]	past ([-l-] conjugation)
[-ɽ-ɲu] ~ [-ːɽ]	past ([-ɽ-] conjugation)
[-ɲu-nda] ~ [-ɲuː-n]	dative subordinate (verbal)
[-ŋa] ~ [-ːŋ]	verbal comitative
[-ŋa] ~ [-ːŋ]	verbal causative

b. **Suffixes which do not alternate by Final Syllable Deletion**

[-nda]	dative (nominal)
[-na]	purposive
[-n-d^{j}i], [-l-d^{j}i], [-ɽ-d^{j}i]	'lest' inflection (in [-n-], [-l-], and [-ɽ-] conjugations)

Note that this list is incomplete, as there are three other suffixes that alternate by syllable count, but in ways that cannot be dealt with by Final Syllable Deletion alone: locative [-la] ~ [-ː], ablative [-mu] ~ [-m], and genitive [-ni] ~ [-ːn] ~ [-ni] ~ [-nɒ].

Looking at the inventory of roots, we find a similar bifurcation. Dixon (D 58) counts 80 roots that alternate by Final Syllable Deletion (e.g. [gindanu-ŋgu] ~ [gindaːn]), and 52 roots that do not undergo the process, even though they are phonologically eligible. An example of the latter is the stem for 'initiated man', which undergoes only Penultimate Lengthening where applicable: [mulaːri] (not *[mulaːr]) ~ [mulari-ŋgu].

Due to all of this lexical idiosyncrasy, the synchronic version of Final Syllable Deletion as stated by Dixon ends up incorporating various mechanisms to make reference to individual lexical items possible:

(4) **Final Syllable Deletion (from D 48)**

$XV_1C_1(C_2)V_2\# \rightarrow XV_1C_1$

if (a) $XV_1C_1(C_2)V_2\#$ is an odd-syllabled word;
and (b) C_1 is one of the set of allowable word-final consonants;

and (c) EITHER (i) there is a morpheme boundary between V_1 and C_1
OR (ii) V_2 is a "morphophoneme": A, I or U

In this formulation, a "morphophoneme" is understood to be the final vowel of one of the stems like /gindanu/ that is (more or less idiosyncratically) eligible for deletion; Dixon writes /gindanU/. Moreover, it is understood that case (4c.i), the suffix truncation case, permits of lexical exceptions, namely the suffixes listed in (3b).

Plainly, if Final Syllable Deletion was once a fully-productive, across-the-board process of Yidiɲ, its current status is rather attenuated, with considerable exceptionality and lexical idiosyncrasy.

2.2 Sources of Vowel Length

It will be important in what follows to consider the sources of vowel length in Yidiɲ. Other than Penultimate Lengthening, already discussed, there are three.

I. Certain suffixes idiosyncratically cause the vowel of the preceding syllable to surface as long. The following is a complete list of these:

(5) **Prelengthening Suffixes**

[-ːd^{j}i]	antipassive	([-n-] and [-l-] conjugations)
[-ːɽ-d^{j}i]	antipassive	([-ɽ-] conjugation)
[-ːli]	'going' aspect	([-l-] conjugation)
[-ːɽi]	'going' aspect	([-ɽ-] conjugation)
[-ːri]	'going' aspect	(pre-comitative allomorph)
[-ːl-da]	'coming' aspect	([-l-] conjugation)
[-ːda]	'coming' aspect	([-ɽ-] conjugation)
[-ːn-bid^{j}i]	'dispersed activity'	

For example, when the antipassive suffix [-ːd^{j}i] is attached to the stem meaning 'see, look' (and the past tense ending [-ɲu] is added to the result), we get [waw**aː**-d^{j}i-ɲu], with length on the second syllable (D 218). Dixon plausibly traces the prelengthening property of these suffixes to historical sources in which the lengthening was compensatory, arising to fill the length slot of the deleting segments. However, as he shows, the synchronic situation appears fairly clearly to involve an arbitrary, morphologically-triggered lengthening.

II. Dixon suggests (D 77-83) that some instances of [iː] derive by monophthongization from underlying /iy/.[5]

III. Finally, in just a few stems, vowel length is an invariant property of the stem; i.e. is phonemic under any analysis. Dixon does not speculate on where these long vowels come from historically; they are unlikely to be ancient, as they do not correspond with the length reconstructed from the evidence of neighboring languages (cf. D 70); and indeed this reconstructed length has been lost in Yidiɲ.

Dixon collected sixteen morphemes with underlying length. Thirteen are disyllables, with the long vowel in final position:

[5] It is not a foregone conclusion that this suggestion should be accepted; in particular, it leads to a puzzling asymmetry in the phonemic long vowel inventory, whereby only two of the three Yidiɲ vowels (/uː/, /aː/) are permitted to occur in underlying forms. If we take [iː] at face value this asymmetry disappears. The cost is a rather peculiar arrangement in suffix allomorphy whereby /i/, arguably the least sonorous vowel, sometimes takes the suffix allomorphs otherwise used for consonant-final stems.

(D 84, 137).

3. A Traditional Analysis

Dixon provides a cogent traditional phonological analysis of the Yidiɲ alternations, using a fairly standard post-*SPE* approach. This account has served as the basis of all subsequent treatments of Yidiɲ. As with many phonological analyses, the synchronic description recapitulates history.

Dixon's basic assumptions are as follows.

- Underlying representations of stems include all the vowels that a stem displays anywhere in its paradigm. Thus the UR of surface [gindaːn] 'moon' is /gindanu/, since the /u/ shows up in suffixed forms like [gindanu-ŋgu].

- Vowels are assumed to be short underlyingly, except in the rare cases where they show up long across the board. Thus the /a/ of [gindaːn] is underlying short /a/, whereas the nonalternating /uː/ of [durguː] is underlyingly long.

- The historical sound changes of Penultimate Lengthening and Final Syllable Deletion are continued in synchronic Yidiɲ as phonological rules, applied in the order just stated. Thus: /gindanu/ → ginda:nu → [ginda:n]. Clearly, rule ordering is required to make this solution work, since the odd-syllabled structural description of Penultimate Lengthening is met only at the deep level of representation, before Final Syllable Deletion has rendered the form even-syllabled.

- Since Final Syllable Deletion is quite irregular in its application, both stems and suffixes are lexically marked for whether they may undergo it.[6]

To my knowledge, all of the many subsequent analyses of Yidiɲ, my own included, have followed Dixon on these basic points. However, the traditional approach has two crucial defects which, to my knowledge, have not been previously noticed. Both indicate that it is not sufficient as a true characterization of the Yidiɲ speaker's knowledge of her language.

4. Defects of the Traditional Analysis I: Distribution of Invariant /V:/

The first problem arises from the restricted distribution of invariant length in Yidiɲ, which is worth examining in detail. By inspecting the forms of (6)-(7), one can easily determine the following:

- There are no invariant long vowels found in **odd syllables**. I will address this gap in section 11.3.3, though it is less central to present concerns.

- Invariant long vowels may never occur in **closed syllables**. This gap will be quite crucial to the discussion, and should be borne in mind.

- Finally, invariant long vowels do not occur in **trisyllabic stems**.[7] A hypothetical case, to show what such a long vowel would look like if it existed, is /nula:ri/, which would show up as [nula:ri] in the unsuffixed absolutive case, and (for example) as [nula:ri-ŋgu] in the ergative.

Note that there are no *phonological* reasons why [nula:ri-ŋgu] could not exist: its length pattern is completely legal. It arises, for instance, when a disyllabic stem with a final long vowel

[6] Dixon uses "morphophonemes" for stems and exception features for suffixes, but the basic distinction is the same.

[7] Or more generally, in odd-syllabled stems. There are so few pentasyllabic stems that the absence of invariant long vowels in them could easily be an accident. No stem in Yidiɲ is longer than pentasyllabic.

is followed by two suffixes, as in [durguː-nu-la] 'mopoke owl-genitive-locative', given above. The same length pattern can also be created when one takes a disyllabic stem and adds two suffixes of which the first is a pre-lengthener: a form given earlier, [wawaː-dʲi-ɲu] 'see-antipassive-past', is an example. Finally, the same length pattern also appears in the monomorphemic form [waɽaːbuga] 'white apple tree', from (7).

Could these gaps in the Yidiɲ stem inventory be accidental? I have calculated the expected number of aberrant stems on the following basis. A rough check of Dixon's Yidiɲ glossary[8] yielded 437 disyllabic stems, of which 13 have a long vowel. There are 55 quadrisyllabic stems, of which 3 have a long vowel. Now, there are 206 trisyllabic stems. Following the percentages observed for the other lengths, we should find somewhere between 6 and 11 trisyllabic stems with a long vowel, but in fact there are none (a fact confirmed by Dixon, D 86). Checking with a chi square test, we find this there is only a 1.2% chance that this situation could arise by accident.

The absence of long vowels from closed syllables likewise appears not to be accidental. Consider that of 398 total stems in the glossary that end in an open syllable, 15 have a final long vowel. There are 301 stems that end in a consonant. Of these, we would expect about 11 to have a long vowel, but none do. A chi square test indicates that the probability that this could arise by chance is about .0007.

One can actually defend the view that Yidiɲ speakers were *tacitly aware* of these data patterns (though not necessarily using the scheme that the traditional analysis posits). As will be seen below, there is good evidence that Yidiɲ speakers often had to concoct inflected forms of stems that they were only familiar with in the bare absolutive form. When they did this, they generally treated surface [Vː] as (in Dixon's terms) a derived [Vː], not an underlying one; thus CVC**Vː**C normally appears suffixed as CVC**V**CV_i-CV, where V_i is some vowel, and CVC**Vː**CV as CVC**V**CV-CV.

The asymmetry in the distribution of long vowels is an unexplained oddity for the traditional approach. In derivational theories, such gaps must be stated as constraints on underlying representations, as follows:

(8) **Yidiɲ Deep Phonotactics**

In underlying representations:

a. There are no trisyllabic stems with a long vowel.

[8] All stems counted except verbs and adverbs, which never have invariant length (see below).

b. There are no long vowels in closed syllables.

These underlying phonotactic constraints will guarantee that there are no alternations of the type *[CVCVːC] ~ [CVCVːC-CV] or *[CVCVːCV] ~ [CVCVːCV-CV]. I take them to be descriptively accurate, but explanatorily deficient: why should there be a ban on long vowels in specifically trisyllabic stems? Further, why should such a ban occur in (of all languages), Yidiɲ, where because of Penultimate Lengthening, on the surface there is a long vowel in *every* trisyllabic stem? Why, in addition, should long vowels be banned underlyingly in closed syllables, where on the surface it is in fact quite normal for a long vowel to occur in a closed syllable?

Intuitively, there is an answer to these questions. Yidiɲ, in the traditional account, is a language with many derived long vowels but few underlying ones. In contexts where derived long vowels abound, apparently Yidiɲ speakers have made the assumption that every long vowel is a derived one. This seems plausible, but it has no straightforward translation in the traditional framework.

For accounts using Optimality Theory, the gaps in the invariant long vowel inventory are more embarrassing still, as under the doctrine of the Richness of the Base (Prince and Smolensky 1993, Smolensky 1996), OT has aspired (rightly, in my opinion) to avoid constraints on underlying forms entirely.

5. Defects of the Traditional Analysis II: Patterns of Vowel Restoration

Putting this problem to the side for the moment, let us consider another difficulty for the traditional analysis. One claim that the traditional approach makes quite explicitly is this: for stems that alternate by Final Syllable Deletion, the allomorph of a stem that packs the greatest amount of phonological information is the suffixed allomorph. This is the allomorph that preserves the crucial final vowel (any of the three Yidiɲ vowels /i/, /a/, or /u/) that cannot be determined by inspecting the truncated isolation stem. The basic pattern of predictability is claimed to be “from the context stem, you can predict the isolation stem”, but not vice versa.

This is the claim, but the actual facts of Yidiɲ are fascinatingly different. In fact, in the great bulk of the cases, the form of the full stem is predictable (up to free variation) from the form of the isolation stem. This view is adumbrated in an interesting section (D 59-65) of Dixon’s grammar.

During the Yidiɲ elicitations, once Dixon had figured out the basic pattern of Final Vowel Deletion, he took care to obtain a suffixed form for every stem he had previously encountered only in the truncated (absolutive) form. In a number of cases, the very same isolation form yielded more than one suffixed form, either from different speakers or from the same speaker on different occasions. The pattern of free variation is complex; and for the moment I will discuss only the most statistically predominant case, which I will call the "standard" outcomes.

There are about 79 stems to consider; namely, those which are truncated in their isolation form but show up with an extra vowel in their suffixed form. As Dixon (p. 60) notes, there is a strong regularity governing what vowel must be added to the base absolutive to obtain the inflected stem: in 57 out of 79 cases, it is a *copy of the second stem vowel*; thus CVC$\mathbf{V}_i$**ː**C ~ CVC$\mathbf{V}_i$C$\mathbf{V}_i$-CV.[9] In the examples below (D 65-68), the vowel that alternates with zero in the paradigm is shown in parentheses; thus [bab**al**(**a**)] abbreviates an alternation such as [balb**aː**l] ~ [balb**ala**-nda]. The vowel copy relation is emphasized here with boldfacing.

(9)

[bab**al**(**a**)]	'bone'
[balb**a**ɽ(**a**)]	'crane'
[banb**a**ɽ(**a**)]	'crane (dialectal variant)'
[band^j**a**ɽ(**a**)]	'madness'
[big**u**n(**u**)]	'shield'
[bin**i**r(**i**)]	'shell, money'
[birg**a**l(**a**)]	'night hawk'
[bulg**u**ɽ(**u**)]	'swamp'
[bul**u**ɽ(**u**)]	'storytime entity'
[buɽ**u**ɽ(**u**)]	'Dyalŋuy: cloud'
[d^{j}ad^j**i**r(**i**)]	'seven sisters; a trap'
[d^{j}ig**u**r(**u**)]	'thunderstorm'
[d^{j}im**u**r(**u**)]	'large house'
[d^{j}in**a**ɽ(**a**)]	'root'
[d^{j}ulŋ**u**l(**u**)]	'waterfall'
[d^{j}um**a**l(**a**)]	'D: straight woomera'
[d^{j}uŋg**u**m(**u**)]	'worm'
[d^{j}uw**a**r(**a**)]	'wattle'
[dumb**u**n(**u**)]	'scorpion'
[gab**u**l(**u**)]	'stick for carrying fish'
[gad^j**a**r(**a**)]	'brown possum'
[gamb**u**n(**u**)]	'type of spirit'
[gaŋ**a**r(**a**)]	'European-type axe'
[gaɲ**a**l(**a**)]	'black scrub locust'
[gaɲ**a**ɽ(**a**)]	'alligator'
[gaɽb**a**ɽ(**a**)]	'mangrove tree'
[gaw**i**ɽ(**i**)]	'crescent shaped'
[gim**a**l(**a**)]	'tree used for fire drills'
[giy**a**ɽ(**a**)]	'stinging nettle tree'
[gud^j**u**n(**u**)]	'wind'
[gumb**a**l(**a**)]	'stage in development of grubs'
[gur**u**n(**u**)]	'language, story, news'
[guy**a**l(**a**)]	'fish hawk'
[guy**i**r(**i**)]	'calm (water)'
[guy**u**ɽ(**u**)]	'storm'
[mad^j**a**l(**a**)]	'tree fern'
[mal**a**ɽ(**a**)]	'spider web'
[mand^j**a**l(**a**)]	'D: water'
[may**a**ɽ(**a**)]	'young initiated man of the *gurabana* moiety'
[mil**i**r(**i**)]	'cramp, pins and needles'
[mind**i**r(**i**)]	'salt-water centipede'
[mud**a**l(**a**)]	'black mangrove tree, garfish'
[muŋ**a**ɽ(**a**)]	'D: scrub turkey'
[muɲd^j**u**ɽ(**u**)]	'plenty'
[ŋuɲ**u**r(**u**)]	'initiated man'
[ŋuɽ**u**l(**u**)]	'shade of bushy plant'

[9] My counts differ slightly from Dixon's due to a different procedure: I omit cases with free variation and cases where the vowel is unknown, but include forms from Dyalŋuy ("mother-in-law language").

[ŋuyg**u**n(**u**)]	'whispered talk'	[wulmb**u**ɽ(**u**)]	'leafy broom'
[ɲuŋg**u**l(**u**)]	'Torres Strait pigeon'	[yab**u**ɽ(**u**)]	'post-pubescent girl'
[waɲdʲ**i**r(**i**)]	'how many'	[yag**u**ɲ(**u**)]	'echidna'
[way**i**l(**i**)]	'red bream'	[yang**a**ɽ(**a**)]	'straight'
[win**a**ɽ(**a**)]	'D: foot'	[yur**u**n(**u**)]	'long time ago'
[wiɽ**u**l(**u**)]	'a shell fish'		

This is an interesting observation, and becomes more so if we add a slight emendation to it: when the consonant that appears at the end of the isolation allomorph is a *nasal*, the vowel that is added is virtually always /u/. This provision brings an additional 14 cases into the realm of predictability:

(10)

[baɽ**iɲ** (**u**)]	'tree used for handles'	[gula**n**(**u**)]	'walnut tree'
[dʲala**m**(**u**)]	'fresh, young'	[guɽba**n**(**u**)]	'crow'
[dʲuri**n**(**u**)]	'leech'	[mala**n**(**u**)]	'right hand'
[gaba**n**(**u**)]	'rain'	[muɽ**in**(**u**)]	'ashes'
[gamb**in**(**u**)]	'top-knot pigeon'	[wanga**m**(**u**)]	'kidney'
[ginda**n**(**u**)]	'moon'	[waŋga**m**(**u**)]	'overhanging cliff'
[gug**iɲ** (**u**)]	'flying fox'	[wuga**m**(**u**)]	'firefly'

As these cases show, the requirement for /u/ after nasals appears to outrank the requirement for the last two stem vowels to be the same; there are no cases at all like "[wug**am**(**a**)]" where the vowel identity requirement overrides the post-nasal /u/ requirement. Naturally, there are a number of examples in which both vowel identity and postnasal position lead to the same result.

Putting Dixon's vowel-copy pattern together with the post-nasal principle, we get a striking result: the inflected stem is to a fair degree predictable from the truncated absolutive stem. I state this principle in preliminary form below:

(11) **Stem Vowel Restoration**

a. If the truncated absolutive stem is [CVC_0V:**N**], where N is a nasal consonant, then the full inflected stem must be augmented by /-u/.

b. Otherwise, the full inflected stem of [$CVC_0$$\mathbf{V_i}$**:**C] must be augmented by /-$\mathbf{V_i}$/.

Of the 79 relevant stems, 71 have their missing vowels filled in correctly by Stem Vowel Restoration. Seven additional cases show free variation, all between the vowel predicted by Stem Restoration and some other vowel.

(12)

[gadʲ**ul**(**a**)/(**u**)]	'dirty (e.g. water)'	[gang**un**(**a**)/(**u**)]	'bushes arranged as trap'
[gaw**ul**(**a**)/(**u**)]	'blue gum tree'	[ɲag**il**(**a**)/(**i**)]	'warm'

[gunb**ul**(**a**)/(**u**)]	'Dyalnguy (?): billy-can'	[wag**a**ɽ(**i**)/(**a**)]	'wide'
[mag**ul**(**a**)/(**u**)]	'a root food'		

In three cases, Dixon could only obtain forms in which the consultants followed the alternate vowel restoration strategy of suffix vowel copying (discussed below in 7.1), so that the inherent stem vowel could not be determined. These cases are listed and discussed in (19) below. Finally, there were only eight cases that are outright exceptions; that is, show an invariant vowel contrary to that predicted by (11). These exceptions are the following:

(13)	[d^{j}amb**ul**(**a**)]	'two'	[gub**um**(**a**)]	'black pine'
	[gang**ul**(**a**)]	'grey wallaby'	[gul**a**ɽ(**i**)]	'big-leaved fig tree'
	[gamb**i**ɽ(**a**)]	'tablelands'	[guŋg**a**ɽ(**i**)]	'north'
	[gaɲd^{j}**il**(**a**)]	'crab'	[waŋ**a**ɽ(**i**)]	'pre-pubescent boy'

Despite these exceptions, it can be argued that Stem Vowel Restoration is productive in Yidiɲ; that is, "psychologically real". In particular, for some forms Dixon located evidence (D 65-68) from cognate stems of neighboring languages which indicate what the originally truncated final vowel must have been. In most of these, it appears that Yidiɲ has altered the original historical pattern of alternation so as to conform to the Stem Restoration principle.

(14)	**Form**	**Gloss**	**Cognate**
	[gaw**ul**(**a**)/(**u**)]	'blue gum tree'	[gawul**a**] (Dya:bugay)
	[mag**ul**(**a**)/(**u**)]	'a root food'	[magul**a**] (Dya:bugay)
	[ɲag**il**(**a**)/(**i**)]	'warm'	[ɲagil**a**] (Gunggay), [ɲigal**a**] Mamu Dyirbal)
	[yag**uɲ**(**u**)]	'echidna'	[yuguɲ**a**ŋ] (Gunggay)
	[muɽ**in**(**u**)]	'ashes'	[murin**i**] (Dya:bugay)
	[band^{j}**a**ɽ(**a**)]	'madness in head'	[band^{j}**a**ɽ] (Dyirbal)
	[d^{j}uŋg**um**(**u**)]	'worm'	[d^{j}uŋgum] (Dya:bugay)
	[gaba**n**(**u**)]	'rain'	[gabaːn] (Dya:bugay)
	[ginda**n**(**u**)]	'moon'	[gindaːn] (Dya:bugay)
	[gugi**ɲ**(**u**)]	'flying fox'	[gugi] (Mamu Dyirbal), [gugiːn] (Dya:bugay)
	[mala**n**(**u**)]	'right hand'	[malaːn] (Dya:bugay)

There are, however, three troublesome forms that work the wrong way:

(15)	**Form**	**Gloss**	**Cognate**
	[gubul(**a**)/(**u**)]	D(?): 'billy-can'	[gunbul**u**] (Ngadjan Dyirbal)
	[wagaɽ(**a**)/(**i**)]	'wide'	[wagar**a**] (Dya:bugay)
	[gambiɽ(**a**)]	'tablelands'	[gamb**il**] (Dyirbal, Mamu Dyirbal)

Assuming that some explanation is possible for these cases (see fn. 24), the main force of the comparative data is that Stem Restoration has been an active force in reshaping the inventory of alternating stems in Yidiɲ . Note that several forms in (14) affirm the greater strength of the post-nasal subcase of Stem Vowel Restoration over the vowel copying subcase.

Consider further the cases of free variation seen in (12). Since these forms always involve a vowel of the quality predicted by Stem Restoration, it seems very likely that these cases illustrate change in progress, with new vowels derived by Stem Restoration displacing the older, etymologically correct vowels.

This, then, is a novel phenomenon to be accounted for. Previously, we have imagined that the truncated allomorph is largely predictable from the full allomorph; this is just what one would expect from a historical process that deleted all three stem-final vowels. But now we can see that *the full allomorph is also largely predictable from truncated allomorph*. It will be recalled from above that 52 of the 132 eligible stems simply don't apocopate; an example is [mulaːri] ~ [mulari-ŋgu] 'initiated man.' Because of these cases, it is not particularly more effective to try to predict the absolutive forms from the inflected forms than vice versa.

6. An Attempt to Save the Traditional Analysis: Deep Constraints

The traditional analysis, as it has always been stated, has nothing to say about the data patterns involved in Stem Vowel Restoration. Could it be beefed up to include these crucial and productive generalizations? Earlier, we rather awkwardly covered a similar problem (the distribution of non-alternating long vowels) by adding constraints on underlying forms. Let us consider the same strategy here:

(16) **Deep Constraints as an Attempted Substitute For Stem Vowel Restoration**

a. In an underlying stem of shape /CVC_0VNV_i/, where N is a nasal, V_i must be /u/.
b. Otherwise, in an underlying stem of shape /$CVC_0V_jCV_i$/, V_i and V_j must be identical.

Interestingly, these proposed constraints *fail empirically*. To see this, recall that about 30% of the eligible trisyllabic stems idiosyncratically fail to alternate by Final Vowel Deletion, instead having trisyllabic allomorphs across the board. In the traditional approach, these stems have just the same kinds of underlying representation as the alternating stems, except that they possess an exception feature that blocks Final Vowel Deletion.[10] Thus, any constraint on underlying forms that holds true of the alternating stems should hold true just as well of the non-alternating ones.

[10] Alternatively, as in Dixon's account, the undergoers bear a special diacritic that triggers the rule.

In fact, this is not so. Among non-alternating stems listed in Dixon's glossary, only 8 out of 21, or 38%, of the stems obey the constraints proposed in (14); this may be compared with the 83-91 % obedience rate (depending on how the free variants are counted) in the alternating stems.

(17) **Obey (11): 8** **Disobey (11): 13**

[baŋga**mu**]	'English potato'	[bib**iya**]	'coconut tree'
[bud^j**a**l**a**]	'fine, finely ground'	[dam**ari**]	'silly'
[dal**iyi**]	'hunger'	[d^{j}iy**uya**]	'catbird'
[dig**ara**]	'coast'	[galg**ali**]	'curlew'
[d^{j}ud**ulu**]	'brown pigeon'	[gaɽa**na**]	'black cockatoo'
[gud^j**ara**]	'broom-like implement'	[gum**aɽi**]	'red'
[gug**ulu**]	'recitative style'	[gurg**iya**]	'khaki bream'
[ŋaw**uyu**]	'salt-water turtle'	[mug**aɽu**]	'fish net'
		[mul**ari**]	'initiated man'
		[mulɲ**ari**]	'blanket'
		[ɲiri**ɲi**]	'long peppery fruit'
		[waɲ**ira**]	'what kind of'
		[yuɽ**iya**]	'saltwater snake species'

There is another comparison possible which makes the same point. In Dixon's glossary, there are 33 stems that in principle would be eligible for Final Vowel Deletion, but cannot undergo it because the final vowel is preceded by an obstruent or by a consonant cluster (both of these conditions reliably block the rule). Now, of these, only 14, or 42% obey the deep constraints (for example, [gud**a**g**a**] 'dog-absolutive'), whereas 19 are like [bind**u**b**a**] 'crayfish-absolutive' and disobey them.

What seems to be the correct generalization is this: the final vowel of a trisyllabic stem is strongly constrained to obey the generalizations of Stem Vowel Restoration only when this vowel alternates with zero. It would seem that Stem Vowel Restoration is a principle governing *the relationships between forms*, not *the shape of underlying forms.* This view will be made the main basis of the analysis below.

Thus, even with the additional device of constraints on underlying forms, the traditional analysis has no grip on the crucial data. The facts suggest rather forcefully, I think, that this analysis should be reconsidered. Before doing so, we must consider further data that also point in this direction.

7. More on Stem Vowel Restoration: The Alternative Strategies

The data pattern of Stem Vowel Restoration is actually more intricate than the previous section suggests. Dixon's careful description (D 59-65) actually records three *additional* patterns, which apparently occur largely in free variation with the statistically dominant pattern just noted.

7.1 The Suffix Vowel Copy Pattern

On some occasions, Dixon's consultants volunteered forms in which the vowel added to the isolation stem was a copy of the vowel of the following suffix. Thus, one consultant gave as the inflected forms of absolutive [gambiːn] 'top-knot pigeon' the following (D 61):

(18)	[gambin**u**-ŋg**u**]	ergative
	[gambin**a**-l**a**]	locative
	[gambin**i**-y**i**]	comitative

In a later elicitation, this consultant provided only forms with [gambin**u** ...], which follow the primary pattern, specifying /u/ post-nasally.[11]

There were three stems Dixon collected which always alternated by this pattern. The notation below shows the copy vowel as "(**V**)".

(19)	[mugiɽ(**V**)]	'small mussels'
	[wubul(**V**)]	'lucky (at hunting, etc.)'
	[wurgul(**V**)]	'pelican'

There is no evidence in Dixon's grammar to support the view that the suffix vowel copy pattern is **obligatory** for these stems, and indeed for the case of [mugiɽ(**V**)] Dixon explicitly states that other outcomes also were found (D 62).

7.2 The Schwa Pattern

There also occurred cases (D 62) in which the "restored" vowel was a schwa. Thus a consultant offered as the genitive of [gubuːm] 'black pine' the form [gubum**ə**ni], instead of the primary (and probably, etymologically correct) form [gubum**a**ni]. The appearance of schwa is extraordinary, since schwa does not otherwise occur as a vowel of Yidiɲ.

7.3 Nonalternation

The last of the three supplementary patterns is the rarest of all: it is simply the attachment of the suffix to the truncated isolation stem itself, as in [gindaːn-dʲi] 'moon-comitative' (D 64). If the suffix involved has a special allomorph for consonant-final stems, such as comitative [-dʲi], that is the allomorph is used (the postvocalic allomorph of the comiative can be seen in the normal variant [gindanu-yi]).

[11] It is unknown whether this vowel is the etymologically correct one.

The nonalternation pattern is only doubtfully well-formed: when Dixon played tapes to his speakers of themselves saying such forms, they sometimes felt that these were errors. Thus whatever analysis is adopted for them should not treat them as fully integrated into the language.

Now, consider again the traditional analysis of the vowel ~ zero alternations. The outlook for this analysis clearly becomes worse when these cases of free variation are considered. Systematic free variation is typically felt to diagnose optional or competing rule systems, but the traditional account has no alternative but to place the variation in the underlying forms themselves, with massive loss of generalization.

8. The Genitive Ending

The Yidiɲ genitive marker [-ːn] ~ [-ni] ~ [-nu] ~ [-nə] provides one further argument against the traditional analysis. Genitive in Yidiɲ is treated by Dixon as a derivational category. The genitive stem created by affixation of [-ːn] ~ [-ni] ~ [-nu] ~ [-nə] is inflected with the normal nominal cases (absolutive, ergative, dative, etc.). Let us consider the distribution of the allomorphs of the genitive.

(a) [-ːn] shows up in absolutives (i.e., "bare genitives") when two conditions are met: that its use should result in a word that is even-syllabled, in accord with the general Yidiɲ preference, and that the stem be vowel final, so that the Yidiɲ requirements for segmental sequencing may be respected.

(20)	[buɲa]	'woman-absolutive'	[buɲa**ː-n**]	'woman-genitive'	D 53
	[dʲadʲa]	'child-absolutive'	[dʲadʲa**ː-n**]	'child-genitive'	D 136
	[ŋunaŋgara]	'whale-absolutive'	[ŋunaŋgara**ː-n**]	'whale-genitive'	D 83

(b) [-ni] appears in absolutives wherever [-ːn] would be disallowed; thus when the base has an odd number of syllables (21a), or when the base ends in a consonant (21b):

(21) a.	[gudaːga]	'dog-absolutive'	[gudaga-**ni**]	'dog-genitive'	D 53
	[guŋgaːdʲi]	'tribal name-abs.'	[guŋgadʲi-**ni**]	'tribal name-genitive'	D 134
b.	[dumbul]	'blue-tongued lizard-absolutive'	[dumbuːl-**ni**]	'b.t. lizard-genitive'	D 134
	[gunduy]	'brown snake-abs.'	[guygaːl-**ni**]	'brown snake-genitive'	D 135

Moreover, any forms created by further suffixation to such bases likewise take [-ni], suitably lengthened where appropriate: [gudaga-**niː**-nda] 'man-genitive-ergative' (D 53), [gunduy-**ni**-la] 'brown snake-genitive-locative' (D 135).

(c) The third allomorph, [-nu], has a remarkable distribution, which may be stated succinctly as follows: the [u] of [-nu] acts as the "restored vowel" of [-ːn]. That is, just in case the plain genitive ends in [-ːn], the inflected genitive will end in [-nu]. Thus, the paradigms like those of (20) may be amplified as follows:

(22)	[buɲa]	'woman-abs.'	[buɲa**ːn**]	'genitive'	[buɲa-**nu**-nda]	'gen.+dative'	D 53
	[d^jad^ja]	'child-abs.'	[d^jad^ja**ːn**]	'genitive'	[d^jad^ja-**nu**-ŋgu]	'gen.+ergative'	D 136

(d) The fourth and final allomorph of the genitive is [-nə]. It occurs in free variation with /-nu/.

What are we to make of this pattern? The distribution of [-ni] vs. [-ːn] plainly follows the normal pattern in Yidiɲ: allomorphy is guided by an even-syllable target. The remaining, more puzzling, cases follow under the assumption that the [u] and [ə] of [-nu] and [-nə] are *restored vowels*, just like the restored vowels of monomorphemic stems. Thus, [buɲaː-n] restores /u/ postnasally in [buɲa-n**u**-ŋgu], but may also restore schwa in [buɲa-n**ə**-ŋgu] (form implied in D 54).[12]

The genitive data are of interest because they illustrate the relative strength of two generalizations that compete. Had Yidiɲ speakers opted for an *invariant underlying form* for the genitive, then the abundant instances of [-ni] (that is, after all odd-syllabled and consonant-final stems) would imply that this allomorph should also appear when Final Syllable Deletion is blocked by the presence of an additional suffix. In actual fact, the inserted [u] and [ə] vowels show that the extra vowel is actually being projected on the basis of the phonological shape of the bare genitive stem form. Thus, Stem Vowel Restoration takes place even when there is substantial evidence available for what the underlying stem vowel is supposed to be.

I take this to be one further reason to hold the traditional account in grave doubt: it must treat the genitive suffix with allomorphy, replicating the pattern that occurs independently with simple noun stems.

9. Theoretical Consequences

All the above discussion has as its immediate conclusion that claim that Yidiɲ is not fully or properly analyzed under the traditional account. The traditional account, because it merely

[12] Dixon does not report cases in which the genitive suffix vowel is restored by Suffix Vowel Copy (section 7.1), or is not restored (non-alternation; section 7.3). I conjecture that this is an accidental data gap: suffix-copy forms, and especially non-vowel-restored forms, are rare, and it could easily have happened that within the relative rare morphological category of suffixed genitives, Dixon did not find any cases.

recapitulates history, does not capture the new patterns that arose as further generations of Yidiɲ speakers reanalyzed the system.

Is this conclusion of importance just to Yidiɲists, or does it have more general theoretical consequences? I would suggest the latter, on several grounds.

9.1 The "Inside-Out" Preference in Phonology

In Hayes (1995b) I suggested, following much earlier work, that phonological systems tend to organize themselves in ways that permit derived forms (such as the suffixed case forms of Yidiɲ) to be predicted from the base forms (usually, as in Yidiɲ, isolation forms). In that article, I presented a couple of examples suggesting that languages often rearrange their phonologies so that this will be true. Further support for this position is presented by Kenstowicz (1996).

The Yidiɲ case is the most intricate case of this sort I have yet seen. It would appear that a massive reorganization of the phonology has taken place, permitting the suffixed allomorphs of stems to be predicted from their isolation allomorphs. In other words, the "direction of predictability" in the system has to a fair degree reversed. In the older system, the isolation form of a stem like [ginda:n] could be predicted from its suffixed form, since the suffixed form provided the crucial information for the character of the underlying form, and the bare absolutive form could then be derived by Final Syllable Deletion. After restructuring, it becomes largely possible to predict the suffixed forms on the basis of the isolation surface form [ginda:n], employing quite general and productive processes. Thus Yidiɲ phonology went from having an "outside-in" character to the (I claim, less marked) "inside-out" type.

It is easy to imagine when this change must have happened: the "outside-in" form of phonology would have been quite stable while Final Syllable Deletion remained as an *optional* pattern of alternation. Archaizing free variants like [ginda:nu], alongside the innovating [ginda:n], would have provided ample evidence to learners for the underlying form of the stem. It is when Final Syllable Deletion became entirely obligatory that the restructuring process would likely have begun.

9.2 Rule Inversion and the Basis of Phonological Constraints

It has been suggested, e.g. by Tesar and Smolensky (1996), that phonology is learned simply by using the input data to rank set of constraints given *a priori*; that is, as part of Universal Grammar. Under this approach, one would expect all phonologies to be highly principled in character, given that all of their ingredients are universal and only their ranking is language-specific.

The facts considered here do not necessarily refute this view. But they do encourage one to think of the acquisition problem in broader terms. Consider the pattern of nominal inflection in Yidiɲ, at the stage in the language's history just after Final Syllable Deletion became obligatory. I will use the term "Pre-Yidiɲ" to refer to this crucial stage. As Dixon points out, the Pre-Yidiɲ data pattern must have been quite hard to learn, because the unsuffixed absolutive stems occur in text more often than all other inflected forms put together. The massive restructuring that took place, converting Pre-Yidiɲ to Modern Yidiɲ, presumably was a direct response to this difficulty.

Let us hypothesize that a major goal of the language-acquiring child is to produce *correct and accurate reproductions* of the inflected forms spoken around her. Given that phonology is often cleanly-patterned and based on constraints of wide applicability, the Tesar/Smolensky strategy of ranking only principled constraints will often suffice, or come close to it, in attaining accurate reproduction. But as we have seen, sometimes historical change deals the child a difficult hand. My contention is that in such cases the child does what is necessary, which includes the creation of relatively ad hoc, language-specific constraints. Yidiɲ seems to be an example of this, especially in its requirement that [u] be the restored vowel after nasals.

The specific scheme I suggest is as follows: in cases of great difficulty, such as was found in Pre-Yidiɲ, the language learner will seize upon generalizations that are *statistically useful, albeit imperfect*, in an attempt to improve her ability to guess the unknown inflected forms of known stems. There are several cases where this appears to have happened here.

Consider first the observation made earlier that (under the traditional analysis) underlying long vowels are excluded from trisyllabic stems. Here, the crucial statistical pattern was that (as a matter of sheer historical accident) the great majority of long vowels in Yidiɲ nouns were due historically to Penultimate Lengthening. Thus, if a language learner heard CVC**Vː**CV in an isolation stem, it was a truly excellent bet that the second stem vowel would appear as short under suffixation: CVC**V**CV-CV. I believe that this is the origin of (what has been called) the ban on underlying long vowels in trisyllables. Whatever invariant long vowels may have existed in trisyllabic stems in Pre-Yidiɲ (these would have had paradigms like CVC**Vː**CV ~ CVC**Vː**CV-CV) were drowned in the statistically predominant pattern of alternating long vowels.[13] The need for language learners to be able to project the vowel lengths of suffixed forms from isolation forms thus rendered it impossible to sustain a vowel length contrast in trisyllabic stems.

The second case to consider is the principles of Stem Vowel Restoration, covered in sections 5 and 7 above. I believe it plausible that these principles also originated as exaggerations of statistical patterns already present in the Yidiɲ lexicon. In attempting to

[13] There is every reason to believe that such long vowels existed, since the historical processes that create long vowels (loss of C from VCV, compensatory lengthening) don't normally care about syllable count.

provide the missing vowel, Yidiɲ learners relied on a slight pre-existing tendency toward vowel harmony in the final syllables of stems, as well as a slight pre-existing preference for /u/ after nasals (see (17) and immediately following discussion). These slight tendencies, which may well have been true *by sheerest accident* in Pre-Yidiɲ, were exaggerated and employed as the best available means of predicting the quality of the inserted vowel in the reanalyzed modern language.

At the time Dixon collected his data, the principles of Stem Vowel Restoration had not yet stabilized; they still competed with rival strategies for stem vowel restoration. These competing strategies, laid out in section 7, were presumably created out of whole cloth by Yidiɲ learners, and indeed they seem to have a more principled, unmarked character. The tendency towards vocalic harmony in epenthetic vowels is widespread in languages, and vocalic harmony also exists as a typical constraint for child phonology. Schwa is likewise a very common quality for epenthetic vowels.[14]

Consider finally the vowel length alternation in the earlier stems that alternated as CVCV:C ~ CVCVCV-CV. Here the projection of suffixed form from isolation form worked with a combination of the previous principles. The exceptionless pattern of inserting a vowel after /...CV:C/ arose from the fact that all, or virtually all isolation stems ending in /...CV:C/ were derived historically by Penultimate Lengthening and Final Syllable Deletion. Any historical stems that had once alternated as CVCV:C ~ CVCV:C-CV would have been drowned in the vastly larger statistical pattern, and undergone readjustment to CVCV:C ~ CVCVC**V**-CV, using the same principles for choice of epenthetic vowel just discussed.

The upshot of all this is, perhaps, an extension of one's conceptions of "where phonology comes from". Rather than constituting just a language-particular prioritization of general, a priori principles, *some* phonology seems to represent the relatively ad hoc response of learners to conundrums presented to them by historical change. Faced with such a conundrum, learners are capable of fabricating entirely new phonology, which has no direct connection with a language's earlier, more "motivated" form. This conclusion relates the present discussion to earlier research on "rule inversion", cited above in the Introduction.

[14] Before concluding that these strategies necessarily constitute "UG in action," however, one would want to rule out an alternative suggested by Dixon (D 62): that the restored vowels are meant to be inconspicuous in their context, thus helping to avoid embarrassment at being unable to remember the "correct" vowel. Schwa is a good candidate here, since it is roughly equidistant perceptually from the three full-vowel possibilities that could otherwise occur. Copying of a neighbor vowel is also a good choice: given the pervasive existence of vowel-to-vowel coarticulation (Öhman 1966), any vowel in the crucial position will be shifted somewhat in the direction of its neighbors. Thus a vowel copying a neighbor is a good bet for resembling the unknown "correct" vowel.

It is true that *most* phonology does seem to have the principled character that arises from well-motivated constraints. The reason for this statistical predominance is that the rather more ad hoc principles of the type discussed here arise only in the context of “rule inversion,” where peculiar historical evolution forces the language learner to develop odd constraints to deal with the resulting data conundrums.

Moreover, we can expect that even the constraints that arise from restructuring of the Yidiɲ type will not be utterly unprincipled; they too must fall at least loosely within the set of constraints possible within phonological theory in general.

9.3 Alternation Not Driven by Phonotactics

In the Introduction to this article I mentioned that it is a great and novel virtue of Optimality Theory that it ties the pattern of alternation in a language to its general phonotactic principles. At the same time, it does seem that there are cases of productive, general alternation that are *not* phonotactically based. Yidiɲ provides several examples.

Consider first the vowel ~ zero alternations. In Yidiɲ, there is absolutely nothing wrong with words that have the shape CVCV:C-CV. These are extremely common, and occur whenever a -CV suffix is attached to a CVCVC stem. An example given earlier is [mud^{j}am] ‘mother-absolutive’ ~ [mud^{j}a:m-gu] ‘mother-purposive’. Nevertheless, Yidiɲ systematically and productively inserts vowels so as to avoid words with the CVCV:C-CV shape, just in case the base form is of the long-voweled type CVCV:C. In brief, we have two patterns of alternation:

(23) a. CVCVC ~ CVCV:C-CV
b. CVCV:C ~ CVCVCV-CV

The pattern in (23b) cannot be phonotactically driven, because the nonalternating alternative (CVCV:C-CV) is exactly what is phonotactically required in the pattern of (23a). [CVCV:C-CV] is an utterly normal surface form in Yidiɲ—but only for a stem that in isolation sounds like [CVCVC]. Stems that in isolation sound like [CVCV:C] must inflect as [CVCVCV-CV].

The vowel length alternations work much the same way. When stems that appear on the surface as CVC**V:**CV get suffixed, one obtains CVC**V**CV-CV, not CVC**V:**CV-CV. But CVCV:CVCV is a perfectly legal word shape in Yidiɲ, as was shown above in section 4.

The reader might object at this point that the [CVC**V**CV-CV] output in forms of the type (23b) are not the result of GEN altering the underlying representations, but simply of the underlying representations surfacing unaltered. But the whole point of the above discussion was to show that this point of view is wrong: the traditional analysis fails to capture the facts in precisely this area. Rather, I believe, and will try to show below, that alternations like CVCV:C ~ CVCVC**V**-CV really are due to processes of epenthesis and vowel shortening, suitably expressed within Optimality Theory. It is these processes that are not motivated by phonotactics.

The Yidiɲ case differs from other examples of this type in a crucial way. In many languages, phonology can be driven by a phonotactic that is not surface-true simply because it has a number of lexical exceptions, or applies to a particular "vocabulary stratum". It is easy to imagine a theory that sets up a treatment for exceptions (e.g. Pater (ms.)) or lexical strata (Ito and Mester 1995), so that such alternations do indeed follow from a phonotactic. The Yidiɲ case is different because there is *no plausible phonotactic at all* present in the language. If Yidiɲ actually had a phonotactic banning words of the shape CVCV:CV, then there would be no way to derive the crucial and pervasive alternations due to Penultimate Lengthening (1).

Thus, classical OT needs amplification; a means of driving alternation even when the phonotactics of the language do not require or even encourage alternation. This is not to deny that phonotactics are the central and normal cause of alternations in phonology; cases like Yidiɲ are the exception, with an origin in historical restructuring.

9.4 Underlying Representations

Consider the task of taking the "Wug" test in Yidiɲ. In this test, named after the seminal work of Berko (1958), the subject is given one inflected form of a novel stem, and is asked to say what the other inflected forms would be; thus, in the classic case, one is asked "What is the plural of [wʌg]?" and replies "[wʌgz]."

For a hypothetical Yidiɲ form like "[baga:n]", we already know that Yidiɲ speakers would pass the Wug test: as shown above, in the past various forms along the lines of [baganu-nda] have already been invented, "correctly", by Yidiɲ speakers. The speakers succeeded in passing the Wug test by inventing the principles of Stem Vowel Restoration, which redefined what counts as the correct answer.

What, then, of the *other* direction for Wug testing, namely suffixed form to plain stem? The sort of question asked here is: "If there were a particular thing that in the dative was called a [baganu-nda], what might be its absolutive form be?"

Here, alas, we lack data on Yidiɲ speakers' Wug-testing performance, but it seems fairly likely (based on my own informal experience in Wug-testing speakers of other languages) that they would be able to name the two most likely candidates, namely [baga:n] and [baga:nu]. Let us suppose tentatively that this is the case, and see what would follow.

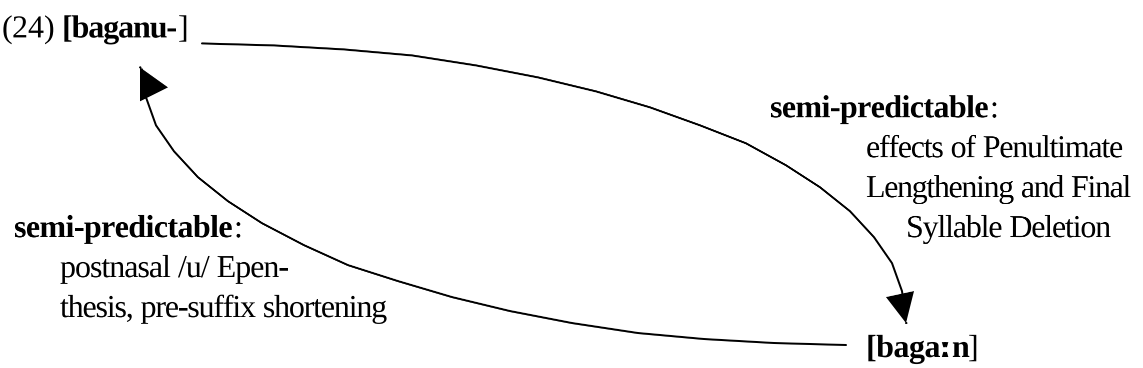
Here is the crucial empirical fact. With roughly 90% certainty, it is predictable in Yidiɲ that the dative form of a hypothetical absolutive [bagaːn] will be [baganu-nda], at least as a free variant. This is because the principles of Stem Vowel Restoration work correctly about 90% of the time. But at the same time, by Dixon's figures (D 58) it is about 70% predictable that the absolutive form of a hypothetical dative [baganu-nda] will be [bagaːn] (and not [bagaːnu]).

With this in mind, we can consider the question: How do speakers pass the Wug test? Under traditional accounts of phonology (both Optimality-theoretic and earlier generative ones), the crucial mediating element is the *underlying representation*. The taker of the Wug test uses her phonological and morphological knowledge in the "backwards" direction to deduce what could be the underlying form or forms of what she is hearing, then applies the morphology and phonology in the forward direction to figure out the predicted surface form (or forms) that answer the original question.

In the Wug test for Yidiɲ considered here, the two reasonable choices for an underlying representation of a surface absolutive [bagaːn] are /bagaːn/, if the alternation is due to epenthesis and vowel shortening process, or /baganu/, if the alternation is actually due to the lengthening and Final Syllable Deletion posited in the traditional account. But *neither* choice does real justice to the pattern of predictability. The underlying representation /bagaːn/ claims that the isolation stem allomorph [bagaːn] is arbitrary from the viewpoint of the inflected form [baganunda] (it is not; it is predictable on about a 70% basis);[15] while /baganu/ claims that the inflected form [baganunda] is arbitrary from the viewpoint of the plain stem [bagaːn] (it is not; it is predictable on about a 90% basis).

This situation, in principle, has major theoretical consequences. As textbooks like Kenstowicz and Kisseberth (1979) ably lay out, the central role of phonological underlying representations is to serve as the repository of unpredictable information concerning the pronunciation of a given morpheme. The patterns of predictability among the members of the paradigm of that morpheme are supposed to follow from the phonological rules (or other principles, such as GEN and constraints in OT), which act to derive all surface allomorphs of a stem from the unique underlying form. What is special about Yidiɲ is that there is *more predictability* present in the system than can be accounted for under the usual assumption of derivation from a single underlying form. The following diagram illustrates this point.

[15] Here again, a careful argument must consider the possibility of making the relevant prediction by imposing restrictions on underlying forms. In the present case, one could do this only by claiming that underlying forms in Yidiɲ must be either even-syllabled, consonant-final, or contain an obstruent or consonant cluster before their final vowel; this is hardly a coherent characterization.

(24)


This situation is not unique to Yidiɲ. In Hayes (1995b), I laid out the evidence for a comparable situation in English. In English, it is largely predictable that forms ending in [...ənt] will alternate with [...ɛnt] upon suffixation, as in numerous pairs like ˈ*elem*[ə]*nt* ~ *ele*ˈ*m*[ɛ]*ntal*, ˈ*accid*[ə]*nt* ~ *acci*ˈ*d*[ɛ]*ntal*, etc. (Here is the Wug test: if X = [ˈpɛɹədənt], what is [Xəl]? Answer: [ˌpɛɹəˈdɛntəl]). But it is *also* predictable that stems which end in [...ɛnt] when affixed will show [...ənt] in their isolation forms (Wug test: if X+əl = [ˌpɛɹəˈdɛntəl], what is X? Answer: [ˈpɛɹədənt]). Derivation from a single underlying form does not suffice to account for both relations.[16]

For now, let us leave the matter as it stands: phonology can involve more relations of predictability than traditional models, based on derivation of all allomorphs from a single underlying form, can handle. The underlying forms seem to be the culprit here; but an improved account awaits some theoretical development, below.

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[16] Some further details, to nail down the argument:

(a) Suppose we use a rule (or equivalent) of Vowel Reduction to guarantee the [...ɛnt] → [...ənt] mapping. Then, to get the [...ənt] → [...ˈɛnt] mapping, we need to restrict underlying forms so that final /nt/ is always preceded by /ɛ/. But this can't be right, because English has many words like *st*[ʌ]*nt*, [æ]*nt*, *st*[ɪ]*nt*, ˈ*galli*ˌ*v*[æ]*nt*, etc. It is only where the principles of English stress happen to make the final syllable stressless (i.e., in polysyllabic nouns) that the underlying vowel must be limited to /ɛ/. So the underlying structure condition would have to duplicate the stress rules in its structural description, a highly undesirable move.

(b) Alternatively, we could suppose that the underlying form of the relevant words ends in /...ənt/, and posit a /ə/ → ɛ / ___ nt] rule, the "Full Vowel Restoration" of Hayes (1995b). But here again, we must keep vowels other than schwa from occurring in this underlying position, else they would show up on the surface when assigned stress. This forces the need for an underlying constraint, just as before, only this time requiring final /nt/ to be preceded by /ə/. Obviously, this constraint, too, is falsified by *stunt, ant, stint*, etc., unless it duplicates the stress rules.

(c) A final option is to make Vowel Reduction cyclic, forcing [...ənt] on the first cycle, with Full Vowel Restoration applying on the second cycle. This fails, because Vowel Reduction cannot in general be cyclic (compare ˈ*at*[ə]*m* ~ *a*ˈ*t*[ɑ]*mic*, ˈ*syst*[ə]*m* ~ *sys*ˈ*t*[ɛ]*mic*.

9.5 Summary

This concludes the part of this article devoted strictly to the empirical exploration of Yidiɲ, with intuitively-drawn theoretical conclusions. To review, there have been two basic problems for conventional derivational phonology, of which I take present-day Optimality Theory to be one variety. These are: that no means is provided to account for the characteristic "inside-out" bias of phonology, and that no means is provided to account for hypercharacterized phonological systems in which there is more interparadigm predictability than can be handled by deriving all allomorphs of a morpheme from a single underlying form.

With regard to OT itself, I have suggested two main lessons from the Yidiɲ facts. First, that it is unrealistic to expect all constraints to be utterly principled manifestations of UG: some constraints result from the efforts of language learners to pass the Wug test (that is, to project novel members of paradigms) in cases where historical change has served them up a difficult data pattern. It seems that in such cases learners will take any port in a storm. Second, it is unrealistic to view all alternation as driven by phonotactics (though obviously, much alternation is). Here again, the need for language learners to deal with the Wug test for difficult data patterns dealt them by the accidents of history leads the learners to create fully-productive and widespread patterns of alternation that have nothing to do with phonotactics.

10. Starting Over

In this section, I will marshal ingredients from current literature that will make possible what I believe to be an improved account of the Yidiɲ data. The theoretical framework assumed is a version of Optimality Theory (Prince and Smolensky 1993), incorporating the formal notion of Correspondence developed in McCarthy and Prince (1995).

10.1 Interparadigmatic Relations as the Basis of Constraints

McCarthy and Prince (1995) proposed a novel form of Optimality-theoretic constraint, the Correspondence constraint, which forces one phonological string to resemble another in some (very specific) respect. McCarthy and Prince's main purpose was to develop an account of the interaction of reduplication and phonology, but in an aside they suggested that similar constraints regulating the surface forms of members of paradigms might play a considerable role in phonology. This amounts to a proposal that *surface analogy*, suitably and rigorously formalized, should form part of synchronic phonological grammar.

This suggestion has led to an explosion of research, already too extensive to cite in full; a partial selection would include Benua (1995), McCarthy (1995), Crosswhite (1996), Kenstowicz (1996), Steriade (forthcoming), Kager (this volume), and Ito and Mester (forthcoming). Various terms have been suggested to designate constraints that regulate the relationship of the surface forms of paradigm members; here I will use Steriade's term Paradigm

Uniformity. The references just cited have solved some quite demanding problems with Paradigm Uniformity constraints.

In this context, Yidiɲ is special, in that a number of the interparadigmatic alternations take the form of *obligatory alternation*, even where non-alternation would be phonotactically possible. In this respect the phenomenon is quite different from the cases studied in the references just cited, all of which focus on the (more common) pattern of obligatory *non*-alternation. But obligatory, non-automatic alternation is not unique to Yidiɲ; in addition to the English [ə] ~ [ɛ] alternation mentioned above, there are instances in Turkish final stops (Hayes 1995b and references cited there) and in Spanish rhotics (Harris 1983, 64-66, esp. fn. 18).

10.2 Anticorrespondence Constraints

As a tentative approach to the problem, let us adopt a rather minimal stance. Assume that the language learner, wherever possible, treats alternation in the standard Optimality-theoretic way, as the result of the subordination of Faithfulness constraints (or perhaps better, of Paradigm Uniformity constraints; see below) to the phonotactic constraints. Where this strategy fails—namely, in cases of non-automatic alternation—cruder devices must be brought out.

The least drastic remedy I can think of, and one that would relate fairly directly to the acquisition process, would be simply to track the forms of morphemes as they occur in particular environments, establishing the string mapping that relates one allomorph to another and the environments that condition these allomorphs. Let a constraint that characterizes such a mapping be called an **anticorrespondence constraint**.

Here is a Yidiɲ example. As noted above, when trisyllabic forms receive an additional syllabic affix, their medial long vowel must appear as short. Thus while the language abounds in alternations like [mul**aː**ri] ~ [mul**a**ri-ŋgu] 'initiated man-absolutive/ergative', there are no alternations like "*[nul**aː**ri] ~ [nul**aː**ri-ŋgu]". This suggests the following constraint:

(25) STEM-PENULTIMATE SHORTENING

$$\text{V}\!ː \; / \; \_\_\_ \; \sigma \;] \; // \; \_\_\_]_{\text{Absolutive}} \;\rightarrow\; \text{V} \; // \; \_\_\_ \; \sigma$$

The notation here is somewhat tricky, involving both single and double environment slashes.

- The single slash refers to the context of the target segment *within the base form from which the derived form is being projected*. Thus, the /aː/ of [mulaːri] fits the single-slash structural description, because it falls within the penultimate syllable of the absolutive.

- The double slashes refer to the *contexts in which the alternating morpheme appears*. Two double slashes are present in the constraint: one specifying final position in the absolutive base form (i.e., no suffix is present) and the other specifying the position before (at least one) other syllable in the suffixed form.

Thus, we can read the STEM-PENULTIMATE SHORTENING constraint as follows: “long vowels that appear in the penult of the absolutive stem must appear as short, when the stem appears before another syllable.”

Such a constraint has a rather crudely descriptive character. It should be remembered, however, that Anticorrespondence constraints arise, according to the present view, only in acquisitional conundrums, where historical change has created a tough data pattern. In such cases, the ordinary analytical approach of ranking Faithfulness constraints against phonotactics has been tried and failed, because the alternation is not phonotactically-driven. In such a case, the simple task of collecting stem allomorphs, and the contexts where the allomorphs occur, at least has the advantage of straightforwardness and directness for the language acquirer.

The particular device of locating the environments of the stems, in addition to the stem-local environments of the alternating segments, is explicitly defended below in section 11.6.

Below, I will develop an analysis of the Yidiɲ facts based in part on Anticorrespondence.

10.3 The Status of Underlying Forms

The remaining ingredient of the analysis below is more controversial: following Flemming (1995), I propose to do without underlying forms. Instead, let us suppose that surface forms are largely projected one from another, using constraints of morphology (affixation), phonotactics, Paradigm Uniformity, and (occasionally) Anticorrespondence constraints.

I suggest this view of things rather tentatively: a vast amount of research in phonology has been based on the assumption that in the normal case, all the allomorphs of a paradigm are underlain by an invariant deep representation. Yet underlying representations have nevertheless proven problematic in various areas. In phenomena such as cyclic phonology (Crosswhite 1996) or reduplicative correspondence (McCarthy and Prince 1995),[17] it is striking how much of the grammar seems to care only about overt, actually pronounced forms, and how little needs to refer to deep, unpronounced representations. Moreover, underlying representations seem to lead to many difficulties for OT, not least the problem of phonological opacity. Given that underlying representations seem inadequate in Yidiɲ even for their most fundamental purpose (relating the various forms of a paradigm) it is perhaps time to start consider alternative models that work differently. Since phonological theory has recently received a fair number of

[17] The one example of Input-Reduplicant correspondence that McCarthy and Prince present, in Klamath, involves phonology that is specific to the reduplication process itself; it seems plausible to reanalyze this by appropriately restating the reduplication mapping .

proposed amplifications (Optimality Theory, Correspondence constraints, Paradigm Uniformity constraints) it is possible that we now possess the theoretical apparatus needed to make underlying representation-less phonology work.

10.3.1 The Proposal

Let us suppose that the main work of morphology is carried out by **morphological mapping constraints**, which relate the various forms of a paradigm to one another, usually by specifying the affixes that must be present. Often, the forms that one would obtain by affixation alone would violate important phonological constraints in the grammar, so that something else actually emerges. In derivational terms we would say that that the phonology modifies the output of the morphology. In the non-derivational approach of OT, we can say that the grammar selects from the choices provided by GEN an output candidate that diverges from the simple concatenated form that we would expect from the morphological mapping constraint acting alone. (The latter is the closest thing we will get to an underlying form here, and it plays no real theoretical role.)

Suppose, for example, that in North American English present participles are specified by a morphological mapping constraint of the form X → Xɪŋ, which projects them from the unaffixed (non-3sg.) present form of the verb. Suppose further that we are dealing with an input that specifies the verb stem *fight* and the morphological features for present participles. Were we to follow the prescriptions of the morphological mapping constraint only, the output would be [ˈfaɪtɪŋ], which is simply the concatenation of the isolation form *fight* [faɪt] and the suffix string specified by the morphological constraint. But [ˈfaɪtɪŋ] competes with a vast number of other possibilities created by GEN,[18] including the rival form [ˈfaɪ**ɾ** ɪŋ]. The latter form is favored over all other candidates, [ˈfaɪtɪŋ] included, due to a high-ranking phonotactic constraint that bans posttonic intervocalic alveolar stops. The Paradigm Uniformity constraints for voicing and sonorancy are insufficiently highly ranked to protect the segment [t] from alternation, so [ˈfaɪ**ɾ** ɪŋ] is the candidate that emerges victorious.

To fill in the scheme in more detail: suppose further that monomorphemic forms are evaluated by the constraints in the usual way in OT. Faithfulness here simply reflects *the ability of the lexicon to enforce pronunciation*. I assume, as in other approaches, that any lexical representation that violated a high-ranking phonotactic constraint would necessarily fail actually

[18] The reader might worry: what does GEN start out with, if there is no underlying representation? Actually, there is no need for GEN to start out with anything; indeed, it could be a vast list, consisting of all possible surface forms, suitably indexed in all possible ways to permit evaluation of Faithfulness and Paradigm Uniformity violations. As is usual in OT, the conceptualization involving GEN abstracts away utterly from the question of how the correct output is to be efficiently found; the latter is construed as a question for the parser rather than the grammar.

to appear in phonetic form, since the phonetic forms are actually provided by GEN, and the winning candidate can be one that is different from the lexical representation when the lexical representation violates a phonotactic constraint which outranks the relevant Faithfulness constraints.[19]

I will limit the use of the basic Faithfulness constraints (in the approach assumed here, the MAX, DEP, and IDENT families of McCarthy and Prince 1995) to mediating the relationship between a listed lexical entry and its surface realization. For derived forms, the crucial constraints are those of the morphology, and the Paradigm Uniformity and Anticorrespondence constraints that relate derived forms to their bases.

10.3.2 Yidiɲ Examples

The absolutive of ‘mother’ in Yidiɲ is [mud^{j}am] (D 42). I assume that there is a morphological mapping constraint in Yidiɲ which specifies that “The purposive corresponding to absolutive [X] is [Xgu]”. In principle, one might expect such a constraint directly to “derive” a purposive from the absolutive. More accurately, however, the morphological mapping constraint is just one of the constraints that select from the candidates provided by GEN in obtaining the form that will serve as the purposive of [mud^{j}am]. As it happens, a powerful phonotactic, corresponding to the traditional rule of Penultimate Lengthening, requires a long penult in odd-syllable forms; and this phonotactic outranks the Paradigm Uniformity constraint that “wants” the final stem vowel to remain consistently short. Thus the actual form selected by the constraint system will be [mud^{j}a:mgu].

The purposive of [mula:ri] ‘initiated man’ is [mulari-gu]. Here, were the morphological mapping constraint for purposives to have its way entirely, the winning candidate for the purposive would have been *[mula:ri-gu]. The victory of the alternative candidate [mulari-gu] is due to the undominated Anticorrespondence constraint STEM-PENULTIMATE SHORTENING, from (25). Since this constraint dominates the Paradigm Uniformity constraint for vowel length, it is likewise able to force the victory of a short-voweled candidate, despite its divergence from the morphologically-expected outcome.

The full set of surface forms is construed as being built thus out of a large set of relationships among the various members of the paradigm.

[19] However, under the assumption of Lexicon Optimization (Prince and Smolensky 1993), the lexical representations of monomorphemic forms are likely to be essentially identical to the surface forms in any event. GEN and candidate selection thus are serving essentially to limit what can be lexically listed.

10.3.3 On Doing Without Underlying Representations

Underlying representation-less phonology is obviously going out on a limb, given what has been accomplished by phonologists using underlying representations. To do without underlying representations will doubtless have some esthetic cost: given that the data pattern of many phonologies is the result of a long series of historical changes accumulating within the lexicon, it would be surprising if a phonology that related surface forms was always able to achieve the same level of generality as a phonology that allowed deep underlying forms; after all, the latter kind of phonology is in a position to recapitulate the history that gave rise to those patterns. This holds true even in OT, though to a lesser extent.

The thoughtful reader, I think, will not immediately take moderate losses of generality to be a fatal problem. What is truly at issue is what language learners do with the data patterns that historical change has bequeathed them. The Yidiɲ case is of interest in that it shows that children are not limited to the obvious kind of analysis that recapitulates history, rather, they are free to seek interesting and useful generalizations that go beyond what theories with unitary underlying forms make available.

The issue of underlying forms might also be contested in the domain of learnability. Any version of linguistic theory must contend with the issue of how large is the hypothesis space that it presents to the language learner. If this space turns out to be unmanageably gigantic, and there is no efficient way for a hypothetical language learner to locate a workable grammar from this hypothesis space, then the linguistic theory has incurred an unforgivable debt on the learnability problem.

I see at present no clear way to establish the relative merits on this score of the two options being considered here. While it is true that letting the language learner posit numerous mappings between surface allomorphs may pose a daunting acquisition task, on the other side there is the issue of locating underlying forms from alternation data. Kenstowicz and Kisseberth (1977, ch. 1) argued that there is no obvious algorithm available for deducing underlying forms from surface forms (they try out quite a few, giving falsifying examples for each). For a hard case, such as the famous Yawelmani one (see Kenstowicz and Kisseberth (1979, 77-99) for quick overview), the underlying forms may require a kind of intuitive leap, which may turn out to be quite hard to make algorithmically. In contrast, the patchwork-like analyses that are likely to emerge in an underlying representation-less theory, though esthetically perhaps less pleasing, may nonetheless be both workable and more accessible to the learner. In particular, a possible virtue of an approach involving Anticorrespondence is that it limits the hypothesis search to various possible string mappings, relating observable surface allomorphs.

Another question to consider is this: if there are no underlying forms, what does the speaker memorize? A reasonable answer to this, I think is: **enough**; in other words, at least enough specific inflected forms for the learner to be able to project all remaining inflected forms from what is already known. In Yidiɲ nouns with vowel-zero alternations, this would typically be at least the plain absolutive form and (for cases like (13) with irregular epenthetic vocalism) at least one inflected form.

Such a view parallels the claim made by Smolensky (1993) for featural underspecification: in Optimality Theory, it is not at all important how much featural detail lexically listed forms contain, so long as they contain enough information to distinguish contrasting forms from one another. Contrast is defined within the constraint system, not the underlying representations. For the present proposal, it likewise does not particularly matter how many surface inflected forms the speaker memorizes, so long as enough are memorized to permit projection of all the unmemorized ones. Again, it is the system of constraints, particularly Paradigm Uniformity, that enforces the crucial patterns, which here are the ways in which the members of a paradigm must resemble one another. The issue of how much the speaker memorizes thus becomes more a question for the psycholinguists, since the phonological theory *per se* is compatible with a vast range of options.

Finally, it should not be imagined that memorization of multiple inflected forms would readily allow for massive suppletion. The whole system is tightly bound by Paradigm Uniformity constraints, many of them undominated, which limit the degree of allomorphy to a relatively small set of lawful patterns. Indeed, it is precisely the existence of Paradigm Uniformity constraints that makes the entire project look feasible.

This concludes a somewhat speculative section on underlying form-less phonology. I wish to emphasize that, for the faint of heart, it would be easy to recast the analysis given below into one in which all alternations were indeed derived from underlying forms (which would correspond, in nouns, to the bare absolutive stems). However, such an analysis would fail to capture the relations of multiple predictability described in (24).

10.4 The Treatment of Free Variation

A final note before proceeding: part of the interest of the Yidiɲ data is the free variation seen in various forms, discussed above in section 7. To analyze this variation, I will adopt what is by now a fairly standard assumption, namely that free variation in output forms is to be treated with free ranking[20] of a subset of the constraints. The relevant subsets appear below in (55) and (57).

[20] Free, not tied: tied ranking would let the decision be made by a lower ranking constraint, which is not what is wanted, at least here.

11. Analyzing Yidiɲ with Anticorrespondence

11.1 The Directions in which Forms are Projected

To begin the analysis, we need to say what forms are projected from what. For the most part, the analysis below will only examine the mapping relations that proceed on an "inside out" basis. That is, suffixed forms are projected from the surface forms of their bases, and so on with the addition of further suffixes. Thus [gindanu-ni] 'moon-genitive' is projected from [gindaːn] 'moon', the isolation form for this stem, by means of (a) [-ŋgu] suffixation, (b) Anticorrespondence constraints forcing the insertion of postnasal [u] and shortening of the stem vowel, and (c) the basic constraints on metrical structure. The form [gindanu-niː-ŋ] 'moon-genitive-ergative' is projected in turn from [gindanu-ni] by means of [-ːŋ] suffixation and the basic metrical constraints.

But this is not the only set of morphological projections. I assume also that Yidiɲ also projects isolation forms from the suffixed forms as well. This accounts for the other direction of predictability. Indeed, for languages like Korean, where the only productive projection principles (involving neutralization of laryngeal and manner features) go from suffixed forms to plain stems, this would be the only direction for this particular mapping could be reliably used.

For reasons of length I will not include constraints projecting isolation forms from inflected forms here. These constraints would largely recapitulate the traditional analysis.

11.2 Morphological Constraints

This is a regrettably underexplored area in OT. I assume that the morphological mapping constraints specify that a particular inflected form is realized as the concatenation of the appropriate base with a particular formative.

In Yidiɲ, affixation is more complex because the language abounds in suffix allomorphy, due in past (at least historically) to the action of the sound change of Final Syllable Deletion (2). Therefore, many morphological categories are affiliated with more than one suffixal allomorph. Each of these allomorphs, I assume has a separate morphological mapping constraint.

Below are examples of morphological mapping constraints for the nominal morphology of Yidiɲ. The set below is not complete, but does exhaust the constraints used in the computed simulation described below. Here is the way the constraints should be read: the first in the list may be interpreted "The ergative form of a given stem consists of the phonological string of that stem in the absolutive, augmented by right-adjacent [ŋgu]." Other constraints may be read analogously.[21]

[21] Plainly, more generality can be extracted from the system; for example, the fact that all inflectional morphology in Yidiɲ is suffixing. This will not be done here, as it is peripheral to our concerns.

(26) **Constraints of Nominal Morphology**

LONG ERGATIVE: Ergative of $X_{[absolutive]}$ = X + [-ŋgu]
SHORT ERGATIVE: Ergative of $X_{[absolutive]}$ = X + [-ːŋ]
POSTCONSONANTAL ERGATIVE: Ergative of $XC_{[absolutive]}$ = XC + [-du]
LONG GENITIVE: Genitive of $X_{[absolutive]}$ = X + [-ni]
SHORT GENITIVE: Genitive of $X_{[absolutive]}$ = X + [-ːn]
LONG ABLATIVE: Ablative of $X_{[absolutive]}$ = X + [-mu]
SHORT ABLATIVE: Ablative of $X_{[absolutive]}$ = X + [-m]
DATIVE: Dative of $X_{[absolutive]}$ = X + [-nda]

The verbal morphology is somewhat different, since there is not so obviously an isolation base form; except for the imperative in the *-l-* conjugation, verbs always bear a suffix. Let us assume that it is basically a stem-based system, as opposed to the more "inside-out" system of inflection in nouns. The morphological constraints can operate here bidirectionally, permitting the projection of Stems from inflected forms and vice versa.

(27) **Constraints of Verbal Morphology**

LONG L-CONJUGATION PAST: Past of $STEM_{[\mathit{l}\ conjugation]}$ = STEM + [-lːɲu]
SHORT L-CONJUGATION PAST: Past of $STEM_{[\mathit{l}\ conjugation]}$ = STEM + [-ːl]
LONG N-CONJUGATION PAST: Past of $STEM_{[\mathit{n}\ conjugation]}$ = STEM + [-ɲu]
SHORT N-CONJUGATION PAST: Past of $STEM_{[\mathit{n}\ conjugation]}$ = STEM + [-ːɲ]
PURPOSIVE: Past of STEM = STEM + [-na]
LONG DATIVE SUBORDINATE: Dative Subordinate of STEM = Stem + [-ɲunda]
SHORT DATIVE SUBORDINATE: Dative Subordinate of STEM = Stem + [-ɲuːn]
LONG ANTIPASSIVE: Antipassive of STEM = STEM + [-ːd^{j}i]
SHORT ANTIPASSIVE: Antipassive of STEM = STEM + [-d^{j}i]
LONG CAUSATIVE: Causative of STEM = STEM + [-ŋa]
SHORT CAUSATIVE: Causative of STEM = STEM + [-ːŋ]

Note that some of the suffix allomorphs are designated as pre-lengtheners, analogously to the pre-lengthening suffixes described above in section 2.2. It is assumed that the constraint is not satisfied unless the length is actually present; thus prelengtheners are *obligatorily* prelengthening. The one exception is the antipassive suffix [-ːd^{j}i], which is only prelengthening when the phonotactics permit. This case is covered here by providing an additional allomorph [-d^{j}i], though other analytical possibilities exist.

The heavy use of allomorphy in these constraints is defended below in section 13.

In the usual case, it will not be necessary to rank against each other the constraints for various allomorphs of the same morphological category. The outcome rather is decided by higher-ranking constraints of the phonotactics. For example, since the phonotactics of Yidiɲ strongly favor words with an even number of syllables, the choice of [-m] vs. [-mu] for the ablative will not reflect any particular ranking among the constraints for these two allomorphs, but simply be determined by the higher-ranking phonotactics, discussed immediately below in 11.3.1.

11.3 Phonotactic Constraints

These are the constraints on (surface) phonological representations. Of these, the most important are the constraints on metrical form.

11.3.1 Metrical Constraints

The crucial generalizations have long been studied by phonologists. By consensus (initiated by Dixon 1977, 41), Yidiɲ feet are disyllabic, and are "left-justified" within the word—in the older derivational view, "constructed from left to right". Unusually, Yidiɲ feet may be either iambic (end-stressed) or trochaic (initially-stressed). They are iambic whenever the quantitative situation would justify it; specifically, whenever the final syllable of at least one foot in a word contains a long vowel. Otherwise, all the feet in a word must be trochaic. This pattern is a natural one, at least according the view of iambic and trochaic rhythm developed in Hayes (1985, 1987, 1995a), McCarthy and Prince (1986), and Prince (1990). The constraints needed are stated under (28); the ideas and terminology are freely borrowed from Prince and Smolensky (1993), Kager (forthcoming), and other work in Optimality-theoretic metrical theory):

(28) a. FOOT BINARITY: All feet are disyllabic
b. ALL FEET LEFT: The string of feet is continuous and left-justified.
c. BAN ON STRAYS: Assess a violation for each unfooted syllable.
d. UNIFORMITY: All feet of a word are uniformly iambic or trochaic.
e. TROCHAIC DEFAULT: Feet are trochaic.
f. WEIGHT-TO-STRESS: All syllables containing long vowels must be stressed.

Some rankings that are applicable here: (a) FOOT BINARITY and ALL FEET LEFT are undominated; this is what makes Yidiɲ phonology so uniformly responsive to the odd-even count of syllables, going from left to right. (b) WEIGHT-TO-STRESS is also undominated; there are no stressless long vowels. In particular, WEIGHT-TO-STRESS dominates TROCHAIC DEFAULT, so that an iambic foot will arise wherever necessary to accommodate a long vowel. (c) UNIFORMITY dominates TROCHAIC DEFAULT, which means that even a foot with two short vowels will be iambic in the presence of an iambic foot elsewhere in the word; see discussion of (29f,g,j) below.

Here are some representative Yidiɲ words that illustrate the metrical generalizations.

(29) a.	(ˈwaɽil)	'doorway-absolutive'	D 41
b.	(ˈwurgu)(ˈlu-ŋgu)	'pelican-ergative'	D 62
c.	(ˈdʲambu)(ˈla-ŋal)(-ˈɲu-nda)	'two-trans. verbalizer-dative subor	D 40
d.	(ˈwuŋa)(ˈbaː-dʲi)(-ˈɲu-nda)	'hunt-antipassive-dative subordinate'	D 40
e.	(ginˈdaːn)	'moon-absolutive'	D 57
f.	(guˈda)(ga-ˈniː-ŋ)	'dog-genitive-ergative'	D 53
g.	(buˈgaː)(-dʲi-ˈɲu)	'eat-antipassive-past'	D 218
h.	(buˈgaː)(-dʲi-ˈnuː-n)	'eat-antipassive-dative subordinate'	D 218
i.	(muˈlaː)ri	'initiated man-absolutive'	D 57
j.	(wuˈŋa)(ba-ˈdʲiː)-na	'hunt-antipassive-purposive'	D 218
k.	(maˈgiː)(-ri-ˈŋaː-l)(-da-ˈɲuːn)da	'climb up-aspect marker-comitative-conjugation marker-coming aspect-dative subordinate'	D 40

All illustrate the left-justified, strictly binary foot system resulting from FOOT BINARITY and ALL FEET LEFT. Examples (29a-c) illustrate the effects of TROCHAIC DEFAULT in words of one, two, and three feet. In (29d) the feet are redundantly trochaic, due both to TROCHAIC DEFAULT and to WEIGHT TO STRESS. Examples (29e-k) all demonstrate that WEIGHT TO STRESS outranks TROCHAIC DEFAULT, in that the feet will be made iambic instead of trochaic if this is necessary to stress long vowels, whatever foot they may occupy. Finally, it can be seen that (29f,g,j) all have iambic feet whose syllables are both light (short-voweled). This is the result of undominated UNIFORMITY forcing iambicity throughout the word; the iambicity is itself due to the need to satisfy undominated WEIGHT TO STRESS.

The stronger metrical constraints have important effects on the possible length patterns of words. Thus, words may contain long vowels in odd syllables, or even syllables, but not both (D 40). Here is the reasoning: because of rigid FOOT BINARITY and ALL FEET LEFT, the odd-even count can be strictly defined on foot structure, so that even syllables are foot-final, and odd syllables are foot-initial (or stray, in final position). Moreover, by undominated UNIFORMITY, which forces consistent foot labeling, either the even or the odd syllables of a word will be stressed. Lastly, because undominated WEIGHT-TO-STRESS forbids stressless long vowels, we get the result just described.

More generally, in such a rigid system the crucial Yidiɲ predicates "even numbered" vs. "odd numbered" have straightforward metrical translations. To give a pertinent example, the choice between syllabic and non-syllabic allomorphs for the same inflectional category (see (3) above) is largely dictated by the BAN ON STRAYS: syllabic allomorphs like [-ŋgu] attach to odd-syllabled stems and non-syllabic allomorphs like [-ːŋ] attach to even-syllabled stems, so that the end result will have an integral number of feet, without strays. Indeed, as Dixon notes (D

40), fully 85% of Yidiɲ words in running text are even-syllabled, a robust statistical effect of the BAN ON STRAYS.

The ability of the BAN ON STRAYS to enforce even-syllabledness is of course limited: in Modern Yidiɲ, quite a few isolation stems like (29i) violate the ban, even though the loss of their final vowel would leave behind a phonotactically well-formed residue. This means that the constraint MAX(SEG), stated below, must dominate the BAN ON STRAYS:

(30) MAX(SEG)

Assign a violation for every segment present in the lexical representation that fails to appear in the output.

11.3.2 Segmental Phonotactics

Also included in the phonotactics are principles which (for example) ban onset clusters, coda obstruents, coda [w], and so on. These will not be formulated here for lack of space, but are laid out quite clearly by Dixon (D 35-37); in the computations here, any candidate that violates Dixon's principles will be assigned a violation of a generic constraint SEGMENTAL PHONOTACTICS. Note that the segmental phonotactics, just like MAX(SEG), dominate the BAN ON STRAYS: a long suffix allomorph is used instead of a short one to avoid an impossible segment sequence, even where this produces an unfooted syllable. For example, the ablative form of [(ˈmuygal)] 'hole, trap' is [(muyˈgaːl)-mu] (D 132), not *[(ˈmuygal-m)], even though [(muyˈgaːl)-mu] suffers from a stray syllable. The reason is that no Yidiɲ word may end in the consonant cluster /lm/.

Another phonotactic is the one that induces Penultimate Lengthening. I have earlier classified Penultimate Lengthening as a characteristic manifestation of the commonplace metrical process of Iambic Lengthening (Hayes 1985, 1995a). This gives the process a teleology, but does not fully specify the environment: it occurs at the right edge of the rightmost foot, whenever it is followed by a stray syllable. This is illustrated in the following examples, repeated from (29i,j).

(31) (muˈl**a**ː)ri
(wuˈŋa)(ba-ˈdʲ**i**ː)-na

One possible metrical statement of the relevant constraint is given below:

(32) PENULTIMATE LENGTHENING

The penultimate syllable must be long-voweled when it precedes a stray syllable.

Though descriptively adequate, this seems somewhat explanatorily deficient; but since our focus here is on morphophonemics rather than the metrical system it will have to suffice for now.

PENULTIMATE LENGTHENING is undominated. It dominates in particular the ordinary Faithfulness constraint that "wants" short vowels in lexical representations to surface as short:

(33) IDENT([LONG])

Vowel length in lexical representations must be matched in the output.

The result of this ranking is that a hypothetical lexical representation like /nulari/ would yield the output form [nulaːri]. GEN would necessarily create [nulaːri] as a candidate, and since it satisfies undominated PENULTIMATE LENGTHENING, it is the candidate that would surface. This is not to say that Yidiɲ actually *has* lexical representations like /nulari/; under the system here the more straightforward /nulaːri/ would suffice as well, and is indeed the representation that would be selected under the principle of Lexicon Optimization (Prince and Smolensky 1993).

11.3.3 Some Weak Phonotactics

As usual in Optimality-theoretic analyses, there are weaker phonotactics present which, though violated frequently, still play a crucial role.

Vowel length in Yidiɲ is phonemic in nouns, but not verbs. That is, while nouns can have idiosyncratic lexical contrasts like those in (34), verbs never show such contrasts.

(34) a.	[waɽ**i**l]	'doorway-absolutive'	D 41
	[way**iː**l]	'red bream-absolutive'	D 41
b.	[marg**u**]	'grey possum-absolutive'	D 84
	[durg**uː**]	'mopoke owl-absolutive'	D 84

Following a standard procedure in Optimality-theoretic analysis (originating with Smolensky 1993), this pattern can be derived by ranking the relevant Faithfulness constraints with respect to the relevant phonotactic constraint, here a ban on long vowels:

(35) IDENT([+LONG]) IN NOUNS
*Vː
IDENT([LONG]) (= (33)

Since IDENT constraints are the ones that allow lexical representations to force their will against the phonotactics, the scheme in (35) will allow nouns, but not verbs, to force surface length. All morphological constraints that provide for a prelengthening suffix outrank *Vː, so they can enforce length in the preceding syllable.

Things are actually a bit more complicated: length is *not* phonemic in the odd-numbered syllables of nouns; such syllables must always surface with short vowels. I suggest that this has a metrical explanation, namely that such vowels would produce "bad" trochaic feet, of the form *heavy + light*. That languages have a tendency to avoid such feet has been argued by Prince (1990) for English and by Hayes (1995a) for Fijian.

(36) *H L TROCHEE

Avoid metrical feet of the form *stressed heavy + stressless light.*

*H L TROCHEE outranks IDENT([+LONG]) IN NOUNS, so in odd syllables of nouns there can be no phonemic length. A hypothetical lexical representation like /xuːrgu/[22] (= (52d) below) would surface as [xurgu], since the constraints would prefer the candidate constructed by GEN in which the relevant vowel appeared as short.

Although *H L TROCHEE outranks all types of IDENT([LONG]) constraints, it is in turn outranked by all constraints that enforce prelengthening in suffixes like [-ːdʲi] 'antipassive'. This permits words such as (53d) [(buˈg**aː**)(**-dʲi**-ˈɲu)] 'eat-antipassive-past' to arise; note that such word types occur only among affixed forms.

11.4 Anticorrespondence Constraints

From the discussion of sections 4-5, we have seen that there are two basic ways in which stems are predictably modified under suffixation. First, long vowels in stem-penultimate or closed-syllable positions surface as short when a syllable is added—despite the fact that if they remained long, the result would be both pronounceable and retain greater uniformity within the paradigm. I state these Anticorrespondence constraints as follows:

(37) a. CVːC SHORTENING

$$\text{V}ː \;/\; \_\_\_\; \text{C} \;] \;//\; \_\_\_\;]_{\text{Absolutive Root}} \rightarrow \text{V} \;//\; \_\_\_\; \sigma$$

b. STEM-PENULTIMATE SHORTENING (from (25))

$$\text{V}ː \;/\; \_\_\_\; \sigma \;] \;//\; \_\_\_]_{\text{Absolutive}} \rightarrow \text{V} \;//\; \_\_\_\; \sigma$$

[22] I will use "x" here, which is not a segment of Yidiɲ, as the initial segment of hypothetical, impossible forms.

These two constraints are undominated in Yidiɲ. In particular, they dominate the Paradigm Uniformity constraint PU([+LONG]) ((47a) below), which would force the long vowels to remain long. The distinction between the structural descriptions "Absolutive" and "Absolutive Root" is discussed below in section 11.6.

Consider next the vowels that are inserted after [...V:C] stems. Here, it seems useful to distinguish between the speaker's knowledge that *some* vowel will be inserted here, and the knowledge of *which* vowel will be inserted: the former is a near-certainty (violations, namely those of section 7.3., were often judged ungrammatical), whereas the latter is more uncertain, with various vowels as candidates.

For the fact that *some* vowel is inserted, we can adopt the following Anticorrespondence constraint ("X" designates some non-null string):

(38) VOWEL RESTORATION

$\varnothing$ / V:C ___] // ___ $]_{\text{Absolutive}} \rightarrow$ V // ___ X

That is, zero corresponding to an isolation stem ending in [...V:C] is replaced by some short vowel in context. The term "restoration" is intended to evoke the historical origin of this constraint, as a restructuring of a former process of Apocope.

The identity of the restored vowel can then be established by relatively low-ranking constraints, which simply specify what vowel qualities ought to be. These constraints leave the vast majority of vowels alone, for they are outranked by the Faithfulness and Paradigm Uniformity constraints on vowel quality (see (42) and (47c) below). The only place they will have any effect is in the vowels that arise by Vowel Restoration, which have no inherent qualities and are thus available for filling in.

The strictest of these vowel quality constraints, in the particular constraint ranking that derives the "standard" vowel restorations of section 5, is the one requiring [u] after nasals:

(39) POSTNASAL [U]

V must be [u] / [+nasal] ___

Further, when the restored vowel is not postnasal, in the standard outcomes it is a copy of the preceding vowel. A standard technical implementation of rightward spread [23] is to require

[23] This originates, I believe, in unpublished work by Robert Kirchner.

alignment (McCarthy and Prince 1994); specifically, to penalize autosegments for each following docking site to which they are not linked. I will casually refer to this here as follows:

(40) SPREAD RIGHTWARD

Penalize each vowel segment for every following docking site to which it is unlinked.

In polysyllabic words, this yield multiple violations, one for each vowel. It is the second of these (the one yielded by the last inherent vowel of the stem) that is crucial below. Here is a schematic example of how SPREAD RIGHTWARD works: [gimala-ŋgu] 'tree species-ergative', where the second [a] is due to VOWEL RESTORATION and SPREAD RIGHTWARD:

(41)
```
g       m       l       ŋ   g
|       |       |       |   |
X   X   X   X   X   X   X   X   X
    |       |                   |
    i       a                   u
```

If the [a] had not spread rightward in this example, it would have racked up a higher violation of SPREAD RIGHTWARD, namely two docking sites instead of one. It cannot spread even further because the suffixal vowel [u] is strongly protected by its morphological affixation constraint LONG ERGATIVE, which cannot be satisfied unless [-ŋgu] (not *[-ŋga]) is attached.

Plainly, other options (including non-autosegmental ones) could account for the same facts; this is simply one implementation.

For concreteness, I also include at this point the faithfulness constraint that prevents SPREAD RIGHTWARD from running roughshod over stems, harmonizing all their vowels:

(42) IDENT(VOWEL QUALITY)

The vowel features appearing in lexical representations must surface unaltered.

The Anticorrespondence constraint VOWEL RESTORATION, amplified with the minor phonotactic constraints POSTNASAL [U] and SPREAD RIGHTWARD, suffices to derive the "standard" vowel restorations of Yidiɲ. The alternative minor strategies (section 7) reflect for the most part just slightly different phonotactics. Thus, the suffix-copy option can derived by leftward spreading, entirely analogous to the rightward spreading that derives the "standard" outcomes. Likewise, the schwa insertion pattern can be derived simply by requiring vowels to be schwa, a commonplace requirement on epenthetic vowels. As before, both constraints are quite weak: when ranked high enough (that is, in a particular variant ranking), they can force the quality of restored vowels, but they are not ranked highly enough to alter the inherent vowel qualities of stems or suffixes.

(43) SPREAD LEFTWARD

Penalize each vowel segment for every preceding docking site to which it is unlinked.

(44) VOWELS ARE SCHWA

Assess a violation for every non-schwa vowel.

By Dixon's account, these two strategies compete with the strategy of copying the stem vowel (and also, I would assume, that of inserting /u/ after nasals). Assuming these strategies are in true free variation, we can account for them by ranking the relevant constraints freely with respect to each other.

The least common of all the variants was sheer non-alternation. This follows from an unusually high ranking of a Paradigm Uniformity constraint to be discussed below under (48).

To cover the small residue of exceptional forms, I suggest (following Pater (ms.)) that minor constraints limited to particular classes of stems occur. The particular constraints that must be posited here are the following:

(45) /A/ RESTORATION

∅ / V:C ___] // ___$]_{\text{Absolutive}}$ → a // ___ X — in the stems [dʲambuːl], [ganguːl], [gubuːm], [gambiːɽ], and [gaɲdʲiːl]

(46) /I/ RESTORATION

∅ / aːɽ ___] // ___$]_{\text{Absolutive}}$ → i // ___ X — in the stems [gulaːɽ], [guŋgaːɽ], and [wangaːɽ]

(The stems listed here are cited in full under (13).)

For the vowel /u/, there is no need for an Anticorrespondence constraint that takes lexical arguments, because all instances of restored /u/ can already be accounted for by the existing, fully general constraints of VOWEL RESTORATION (38), POSTNASAL [U] (39), and SPREAD RIGHTWARD (40). Note further that /I/ RESTORATION has an extremely specific environment, namely / aːɽ ___, which accounts for every one of the cases of restored /i/. Here again, we see the ability of Yidiɲ speakers to seize upon microscopic generalizations, whenever they help maintain the predictability of the restored vowel.[24]

We saw earlier (under (12)) that the general constraints POSTNASAL [U] and SPREAD RIGHTWARD are in the process of extending their scope: certain stems take either an irregular restoration vowel (descended from the earlier period of the language) or optionally the vowel predicted by the regular constraints. I would treat this as vacillation (sometimes across speakers, sometimes for a single speaker, D 60-61) in the membership of the arbitrary sets of stems mentioned in each constraint. In particular, the stems [gadʲuːl], [ganguːn], [gawuːl], [maguːl], and [ɲagiːl] (from (12)) are included for some speakers and/or occasions in the list of stems for /A/ RESTORATION (thus variation of the type [gangun**a**-ŋgu] ~ [gangun**u**-ŋgu]), and the stem [wagaːɽ] is optionally included in the set of stems for /I/ RESTORATION.

11.5 Paradigm Uniformity Constraints

Paradigm Uniformity constraints are quite crucial to the approach taken here: they take the place of the underlying representations in enforcing the similarity of allomorphs within the paradigm. I assume that the default position of a Paradigm Uniformity constraint in the grammar is undominated; the language learner expects, a priori, that morphemes will not alternate. The evidence for this is the massive body of evidence that grammatical change tends to be in the direction of "cyclicity" and paradigm leveling.

In the present analysis, most of the Paradigm Uniformity constraints are just tacitly assumed, but the following are included explicitly since they interact crucially with other constraints.

(47) a. PU([+LONG]): Assign a violation to derived forms containing a short vowel corresponding with a long vowel in the absolutive base.

b. PU([-LONG]): Assign a violation to derived forms containing a long vowel corresponding with a short vowel in the absolutive base.

---

[24] /I/ RESTORATION is, however, not a regular process: there are ten stems in Dixon's glossary that end in /aːɽ/ and restore the vowel /a/, following the regular pattern specified by (40) SPREAD RIGHTWARD. But a certain amount of productivity for /I/ RESTORATION is not out of the question. Consider the two forms in (15) where Yidiɲ restored /aɽi/ corresponds to /aɽa/ in forms from related languages: this suggests that /aɽi/ might be innovative. The other historically paradoxical correspondence of (15), Yidiɲ [gubul(**a**)/(**u**)] 'billy-can' ↔ Ngadjan Dyirbal [gunbul**u**] might also reflect a minor competing pattern, since several of the Yidiɲ stems that exceptionally restore /a/ happen to end in /uːl/; see (12) and (13).

The small-scale, competing generalizations seen here are quite reminiscent of the patterns of past tense formation in English strong verbs, discussed for example in Pinker and Prince (1994).

c. PU(VOWEL QUALITY): Assign a violation to derived forms containing a distinct vowel quality from that in the base form.

d. PU-MAX(SEG): Assign a violation to derived forms in which the null string corresponds to a

I have formulated PU([+LONG]) and PU([+LONG]) to refer only to the absolutive base form of nouns; verbs in Yidiɲ are devoid of PU([+LONG]) effects, as their length patterns are determined solely by the phonotactics and the distribution of prelengthening suffixes. Even in nouns, these Paradigm Uniformity constraints are frequently violated. PU([-LONG]) is violated whenever an output form requires a long vowel to satisfy the PENULTIMATE LENGTHENING constraint. PU([+LONG]) is violated when the Anticorrespondence constraints CV:C SHORTENING and STEM-PENULTIMATE SHORTENING, which dominate it, force a vowel to be shortened.

The Paradigm Uniformity constraint on vowel quality may be assumed to be undominated, since vowel features do not alternate within paradigms.[25] An important consequence of this is the retention of the word-final genitive allomorph [-ni] in inflected genitives; thus, the final vowel /i/ of (21a) [wagud^{j}a-**ni**] 'man-genitive' persists in [wagud^{j}a-**ni:**-nda] 'man-genitive-dative'. The crucial ranking here is PU(VOWEL QUALITY) >> (39) POSTNASAL [U].

A Paradigm Uniformity constraint that varies in its ranking is the one that requires derived forms never to contain segments that are absent from their bases:

(48) PU-DEP(SEG): Assign a violation to derived stems which contain a segment for which there is no corresponding segment in the base form.

Normally, PU-DEP(SEG) is outranked by VOWEL RESTORATION (38), which forces certain suffixed stems to appear with vowels that the base form (the isolation absolutive) lacks. Recall, however, that as a marginal option (section 7.3), the vowel restoration process is blocked, and the isolation stem appears unaltered in the base. This reflects a marginally possible ranking in which PU-DEP(SEG) dominates VOWEL RESTORATION.

11.6 Bases

Crosswhite (1996), in a Paradigm Uniformity-based treatment of Chamorro phonology, notes an important distinction that must be considered carefully in carrying out Paradigm Uniformity-based phonological analysis. Suppose that a particular form is derived by attaching two suffixes to a root, as in: [[[ROOT]-Suff$_1$]-Suff$_2$]. Suppose further that [[ROOT]-Aff$_1$] is a

[25] They alternate *across* paradigms, as in the different forms of the genitive suffix [-ni] ~ [-nu] ~ [nə], but that is a different thing: it is not at all clear that affixes have paradigms.

possible word, and that all suffixation involved is productive and compositional. Question: should the Paradigm Uniformity constraints that govern the form of [[[ROOT]-Aff$_1$]-Aff$_2$] refer to [ROOT]-Aff$_1$] as their base (more generally, to the most "recent" morphological ancestor), or to the ROOT? Crosswhite suggests that both possibilities are empirically attested, and that constraints must be able to make a distinction. She terms the first case Paradigm Uniformity based on the "proximate derivational precedent" and the second Paradigm Uniformity based on the "remote derivational precedent."

Yidiɲ phonology shows a somewhat parallel phenomenon. Recall that the Anticorrespondence constraint CV:C SHORTENING was stated so as to refer to the Absolutive Root, not just any input absolutive. The reason for this is an interesting distinction between two triplets pointed out by Dixon (D 137):

(49) 'person' 'mopoke owl'

[bam**a**]	[durg**u:**]	absolutive (= plain stem)
[bam**a:**-n]	[durg**u:**-n]	genitive
[bam**a**-nu-la]	[durg**u:**-nu-la]	genitive with locative inflection

Although vowel length in these forms is neutralized in the plain genitive, the length distinction reappears in the suffixed genitives. My conjecture is that this is because CV:C SHORTENING affects only plain roots (cf. [gind**a:**n] ~ [gind**a**nu-la] 'moon-absolutive/locative,' D 57), not CV:C syllables formed by affixation. VOWEL RESTORATION (38), on the other hand, is sensitive only to the absolutive form from which the genitive is being projected. Thus, even when the crucial triggering [CV:C] syllable was created by affixation of the [-:n] allomorph of the genitive, as in [bama:-n] ~ [bama-n**u**-la], VOWEL RESTORATION forces an inserted vowel.

In the present grammar the contrast between [bam**a**-nu-la] and [durg**u:**-nu-la] follows from IDENT([+LONG]) IN NOUNS. This constraint forces the long vowel of the lexical representation /durgu:/ to appear unaltered, in the face of the conflicting (but dominated) constraint *V:. The latter constraint is what forces a short vowel in [bam**a**-nu-la]. The basic patterns are summarized in the following tableaux, which include the three relevant constraints. The form [gindanu-la] 'moon-locative' is included for comparison; since it is monomorphemic, its short second vowel is forced by CV:C SHORTENING, which refers to the absolutive root [ginda:n].

(50)

a. /durgu:-n+LOC/	☞ (durˈgu:)(nu-ˈla)	*(ˈdurgu)(ˈnu-la)
CV:C SHORTENING		
IDENT([+LONG]) IN NOUNS		*!
*V:	*	

b. /bamaː-n+LOC/	☞ (ˈbama)(-ˈnu-la)	*(baˈmaː)(-nu-ˈla)
CVːC SHORTENING		
IDENT([+LONG]) IN NOUNS		
*Vː		*!

c. /gindaːn+LOC/	☞ (ˈginda)(ˈnu-la)	*(ginˈdaː)(nu-ˈla)
CVːC SHORTENING		*!
IDENT([+LONG]) IN NOUNS	*	
*Vː		*

The data in (49) are of interest in that they trim down the range of possible analyses for Yidiɲ. In particular, it is tempting to regard vowel length alternations like [muˈl**aː**ri] ~ [ˈmul**a**ˈri-ŋgu] 'initiated man-absolutive/ergative', from (52a,f), as derived by a violable phonotactic similar to the constraints that cause Trisyllabic Shortening in English and other languages (cf. English ***o****ːmen* ~ ***o****minous* and other cases mentioned in Hayes (1995a, 148, 224)). The phonotactic, however it is to be formulated, would have to be dominated by the constraints specifying prelengthening suffixes, to get forms like (53k) [buˈg**aː-dʲi**-ˈɲu] 'eat-antipassive-past', and it would also have to be somehow limited to "derived environments" (in the sense of Kiparsky 1973), so as to preserve the lexically-specified long vowel of (7) [waɽ**aː**buga] 'white apple tree'.

The form [durguː-nu-la] in (49) is important in that it demonstrates that a Trisyllabic Shortening approach to Yidiɲ is unworkable. Here we have what is plainly a derived environment, with no prelengthening suffix present, yet the long stem vowel remains. The present approach, with Anticorrespondence, handles this correctly, since it posits that the crucial cases like [gind**aː**n] ~ [gind**a**nu-la] involve alternations in the *shapes of stems*, rather than constraints on word shape such as a Trisyllabic Shortening approach would imply.

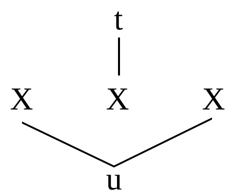
This completes the discussion of the constraints needed for the present analysis.

12. Testing the Grammar

To test the analysis, I developed a set of 39 representative Yidiɲ forms, using various stems and endings intended to exhaust the relevant types. These included various stems that have a "missing" vowel projectable by means of Anticorrespondence and related constraints. Candidates were provided that (in my judgment) seemed likely to provide a thorough test of the constraint set. This set of candidates is reproduced below in (52)-(53). Note that in cases of free variation, there are several "winners".

Here are some notes on representations. The autosegmental spreading of vowel quality is given by an ad hoc notation involving upper case letters; thus /UtU/ is the shorthand for something like this:

(51)



Further, metrical structure is not included in the base forms from which the affixed forms are derived. Since these forms are actual surface forms, they are indeed metrified, but this is omitted for brevity. There are no Paradigm Uniformity constraints on metrical structure ranked high enough to cause the metrical structure of base forms to influence that of derived forms, so this omission is harmless.

Here is the set of test forms, with comments attached to each concerning what it meant to show. For the polymorphemic forms in the set, “Target” means the inflected form that is being derived; immediately afterward the form on the basis of which the target is being generated is listed. In monomorphemic forms, the goal is simply to show that the grammar permits an appropriate lexical representation to force the correct surface form. Various rankings that are justified by these forms are noted.

(52) **Nominal Forms**

Absolutives (= isolation forms)

a. Target: **mulaːri** ‘initiated man-absolutive’ D 57
Winner: (muˈlaː)ri
Rival: *(muˈlaːr)
Demonstrates that Final Vowel Deletion is no longer active in monomorphemes.
Ranking: MAX(SEG) >> BAN ON STRAYS

b. Target: **gindaːn** ‘moon-absolutive’ D 57
Winner: (ginˈdaːn)
Rival: *(ˈgindan)
Demonstrates that nouns can possess long vowels in even syllables. Ranking:
IDENT([+LONG]) IN NOUNS >> *Vː, TROCHAIC DEFAULT

c. Target: **durguː** ‘mopoke owl-absolutive’ D 84
Winner: (durˈguː)

Rival: *(ˈdurgu)

Same as immediately above, only with an open instead of closed even syllable.

d. Target: **xuːrgu** (hypothetical lexical representation)

Winner: (ˈxurgu)

Rivals: *(ˈxuːrgu), *(ˈxuːr)(ˈguː)

There can be no phonemic length in the odd syllables of nouns: such length is lost because *H L TROCHEE dominates IDENT([LONG] IN NOUNS. Thus, if there *were* an underlying form like "/xuːrgu/", the length would be lost, because GEN would create a more successful lengthless candidate which would be selected by the constraint system.

Ergatives

e. Target: **buɲa+ERG** ‘woman-ergative’ D 45
Winner: (buˈɲaː-ŋ)
Rival: *(buɲaː-ŋ)gu
Choice of ergative suffix determined by disyllabic target. Ranking: BAN ON STRAYS >> LONG ERGATIVE.

f. Target: **mulaːri+ERG** ‘initiated man-ergative’ D 57
Winner: (ˈmula)(ˈri-ŋgu)
Rivals: *(muˈlaː)(ri-ŋˈgu), *(muˈlaː)riː-ŋ, *(muˈlaːr)-du
Choice of ergative suffix determined by disyllabic target. Ranking: BAN ON STRAYS >> SHORT ERGATIVE. Also demonstrates full productivity of STEM-PENULTIMATE SHORTENING, which must outrank IDENT([+LONG]) IN NOUNS.

g. Target: **wagal+ERG** ‘wife-ergative’ D 127
Winner: (waˈgaːl)-du
Rivals: *(waˈgaːl)-ŋgu, *(waˈgal)-du, *(waˈgaːl)-ŋ
Demonstrates requirement for [-du] allomorph of ergative after consonants (POSTCONSONANTAL ERGATIVE >> LONG ERGATIVE), as well as inviolable pattern of Penultimate Lengthening (PENULTIMATE LENGTHENING >> *Vː, PU([-LONG]).

h. Target: **gindaːn+ERG** ‘moon-ergative’ D 57
Winners: (ˈginda)(ˈnU-ŋgU), (ˈginda)(ˈnə-ŋgu), (ginˈdaːn)-du
Rivals: *(gindaːn-ŋ), *(giˈndaː)(nU-ˈŋgU), *(ˈgindA)(ˈnA-ŋgu), *(ˈginda)(ˈnu-ŋgu)
Basic restoration of [u] after [...VːN]; with schwa and non-alternating variants resulting from the free rankings given in (55) and (57) below. Note that since SPREAD LEFTWARD is active in the grammar, a spread [u] is preferred to an inserted one, since both satisfy POSTNASAL /U/. For the failed candidate *(ginˈdaː)(nu-ˈŋgu), see section 11.6 above.

h. Target: **naguːl+ERG** ‘stick for carrying fish-ergative’ (construct; cf. D 60)
Winners: (ˈgagU)(ˈlU-ŋgu), (ˈgagu)(ˈl-U-ŋgU), (ˈgagu)(ˈl-ə-ŋgu), (gaˈguːl)du
Rivals: *(gaˈgUː)(lU-ŋˈgu), *(gaˈguːl)-ŋgu, *(ˈgagu)(ˈl-a-ŋgu)
This example is quite similar to the one above, but the restoration of [u] is by either rightward *or* leftward spreading, depending on whether the detailed rankings are set to form the “standard” outputs or the Suffix Vowel Copy ones (section 7.1).

i. Target: **gubuːm+ERG** ‘black pine-ergative’ (construct; cf. D 107)
Winner: (ˈgubu)(ˈma-ŋgu)
Rivals: *(ˈgubu)(ˈmu-ŋgu), *(ˈgubu)(ˈmə-ŋgu), *(guˈbuːm)du, *(ˈgubU)(ˈmU-ŋgu), *(ˈgubu)(ˈmU-ŋgU)

/gubuːm/ falls under the scope of the minor (but undominated) constraint /A/ RESTORATION, which dominates the constraints that would result in any other outcome: PU-DEP(SEG), VOWELS ARE SCHWA, and POSTNASAL /U/.

Ablatives

j. Target: **bana+ABL** ‘water-ablative’ D 133
Winner: (ˈbana-m)
Rivals: *(baˈnaː-m), *(baˈnaː)-mu, *(ˈbana)-mu, *(baˈna-m)

Choice of ablative allomorph by even-syllable target. Note that the [-m] allomorph is not a pre-lengthener. The effects of TROCHAIC DEFAULT can be seen in ruling out *(baˈna-m).

k. Target: **gindaːn+ABL** ‘moon-ablative’ D 57
Winners: (ˈginda)(ˈnU-mU), (ˈginda)(ˈnə-mu), (ginˈdaːn)-mu
Rivals: *(ˈginda)(ˈni-mu), *(ginˈdaːn)-m, *(ˈgindA)(ˈnA-mu), *(ˈginda)(ˈnu-mu)

Full allomorph [-mu] of the ablative, even in the (marginal) non-vowel-restoring last variant, where the short allomorph [-m] would not be syllabifiable.

l. Target: **mulaːri+ABL** ‘initiated man-ablative’ D 57
Winner: (ˈmula)(ˈri-mu)
Rivals: *(muˈlaː)ri-m, *(muˈlaː)(ri-ˈmu)

Penultimate Shortening, and choice of the long ablative allomorph by the even-syllable target.

m. Target: **durguː+ABL** ‘mopoke owl-ablative’ D 84
Winner: (durˈguː-m)
Rivals: *(ˈdurgu-m), *(durˈguː)-mu

Demonstrates that the ablative allomorph [-m] is not a “pre-shortener”; for discussion see Dixon 51-52.

Datives

n. Target: **bimbi+DAT** ‘father-dative’ D 130
Winner: (bimˈbiː-n)da
Rival: *(ˈbimbi-n)da

Dative [-nda] has no truncated counterpart; triggers Penultimate Lengthening.

Genitives

o. Target: **gaguːl+GEN** 'stick for carrying fish-genitive' (construct; cf. D 60)
Winners: (ˈgagU)(ˈlU-ni), (ˈgagu)(ˈlI-nI), (ˈgagu)(ˈlə-ni), (gaˈguːl)-ni
Rival: *(gaˈgUː)(lU-ˈni)
Full allomorph of the genitive, with various forms of stem vowel restoration.

p. Target: **bimbi+GEN** 'father-genitive' D 134
Winner: (bimˈbiː-n)
Rivals: *(bimˈbiː)-ni, *(bimˈbiː)-nu
Demonstrates choice of prelengthening [-ːn] allomorph of genitive, guided by even-syllabled target. Ranking: BAN ON STRAYS >> LONG GENITIVE.

q. Target: **mulaːri+GEN** 'initiated man-genitive' D 57
Winner: (ˈmula)(ˈri-ni)
Rival: *(muˈlaː)(ri-ˈni)
Demonstrates the [-ni] allomorph of the genitive, and the Anticorrespondence constraint STEM-PENULTIMATE SHORTENING, which must dominate PU([+LONG]).

r. Target: **gindaːn+GEN** 'moon-genitive' D 57
Winners: (ˈginda)(ˈnu-ni), (ˈginda)(ˈnI-nI), (ˈginda)(ˈnə-ni), (ginˈdaːn)ni
Rivals: *(ginˈdaːn-n), *(ˈgindA)(ˈnA-ni)
In the "standard" output for this genitive, [u] must be actually inserted, not spread, since no spreading source is present.

s. Target: **durguː+GEN** 'mopoke owl-genitive' D 84
Winner: (durguː-n)
Rival: *(durˈguː)-ni
Length in second syllable of output is redundantly determined by PU([+LONG]) and the prelengthening short genitive allomorph, selected by the even-syllable target.

Suffixed Genitives

t. Target: **gudaga-ni+ERG** 'dog-genitive-ergative' D 53
Winner: (guˈda)(ga-ˈniː-ŋ)
Rivals: *(guˈda)(ga-ˈnu-ːŋ), *(guˈda)(gaˈ-niː-ŋ)gu, *(guˈda)(gə-ˈniː-ŋ)gu
Demonstrates preservation of surface [i] of genitive [-ni], under further affixation. Crucial rankings: PU(VOWEL QUALITY) >> POSTNASAL /U/ and VOWELS ARE SCHWA.

u. Target: **buɲa:-n+ERG** ‘woman-genitive-ergative’ D 45
Winners: (ˈbuɲa)(-ˈnU-ŋgU), (ˈbuɲa)(-ˈnə-ŋgu), (buˈɲa:n)-du
Rivals: *(ˈbuɲa:)(ˈnU-ŋgU), *(ˈbuɲa)(ˈni-ŋgu), *(ˈbuɲA)(-ˈnA-ŋgu), *(ˈbuɲa)(ˈnu-ŋgu)
Full set of vowel restoration possibilities with the genitive suffix. Since the base for this form with respect to VOWEL RESTORATION is the absolutive [buɲa:-n], the typical patterns for vowel restoration in absolutives are applicable. For the victory of [(ˈbuɲa)(-ˈnU-ŋgU)] over *[(ˈbuɲa:)(ˈnU-ŋgU)], see section 11.6.

v. Target: **durgu:-n+ERG** ‘mopoke owl-genitive-ergative’ (construct; cf. D 137)
Winners: (durˈgU:)(-nU-ˈŋgu), (durˈgu:)(-nU-ˈŋgU), (durˈgu:)(-nə-ŋˈgU), (durˈgu:n)-du
Rivals: *(ˈdurgU)(-ˈnU-ŋgu), *(durˈgu:)(-nu-ŋˈgu)
See discussion in section 11.6.

(53) **Verbal Forms**

Past Tense

a. Target: **gali+PAST** ‘go-past’ D 212
Winner: (gaˈli:-ɲ)
Rivals: *(gaˈli:)-ɲu, *(ˈgali-ɲ)
Choice of short allomorph [-:ɲ] is dictated by the even-syllable target. Ranking: BAN ON STRAYS >> LONG N CONJUGATION PAST.

b. Target: **wuŋaba+PAST** ‘hunt-past’ (construct; cf. D 212)
Winner: (ˈwuŋa)(ˈba-ɲu)
Rivals: *(ˈwuŋa)ba:-ɲ, *(ˈwUŋU)(ˈba-ɲu)
Choice of long allomorph [-ɲu] is dictated by the even-syllable target. Ranking: BAN ON STRAYS >> SHORT N CONJUGATION PAST.

Purposive

c. Target: **buga+PURPOSIVE** ‘eat-purposive’ (construct; cf. D 212)
Winner: (buˈga:)-na
Rivals: *(buˈga:-n)
The purposive possesses no short allomorph, so [-na] is used invariantly despite the even-syllable target.

d. Target: **wuŋaba+PURPOSIVE** ‘hunt-purposive’
Winner: (ˈwuŋa)(ˈba-na) (construct; cf. D 212)
Rivals: *(wuˈŋaː)ba-n
Use of [-na] in a form where it is compatible with the even-syllable target.

Dative Subordinate

e. Target: **buga+DATIVE SUBORD.** ‘eat-dative subordinate’
Winner: (ˈbuga)(-ˈɲunda) (construct; cf. D 212)
Rival: *(buˈgaː)-ɲun
The even-syllable target selects the long allomorph [-ɲuːnda].

f. Target: **wuŋaba+DATIVE SUBORD.** ‘hunt-dative subordinate’
Winner: (wuˈŋa)(ba-ˈɲuːn) (construct; cf. D 212)
Rivals: *(wuˈŋa)(baː-ˈɲuːn), *(ˈwuŋa)(ˈbaː-ɲuːn), *(ˈwuŋa)(ˈbaː-ɲun), *(wuˈŋa)(ba-ˈɲuːn)da
The even-syllable target selects the short allomorph [-ɲuːn].

Causative

g. Target: **mada+CAUSATIVE+IMPER.** ‘make soft-imperative’ D 55
Winner: (maˈdaː-ŋ)
Rival: *(maˈdaː)-ŋa
The even-syllable target selects the short allomorph [-ːŋ]. In this conjugation, the imperative suffix is null.

h. Target: **mada+CAUSATIVE+PRES.** ‘make soft-present’ D 55
Winner: (maˈdaː)-ŋa-l
Rival: *(ˈmada-ŋ-l)
The syllabic allomorph [-ŋa] of the causative is forced, despite by even-syllable target, by segmental phonotactics. Ranking: SEGMENTAL PHONOTACTICS >> BAN ON STRAYS.

i. Target: **mada+CAUSATIVE+PAST** ‘make soft-past’ D 55
Winner: (ˈmada)(-ˈŋa-l-ɲu)
Rivals: *(ˈmadaː-ŋ-l)-ɲu, *(maˈdaː-ŋ-l), *(maˈdaː)-ŋaː-l
The even-syllable target is satisfied by the syllabic allomorphs of the causative and the past. In principle, two non-syllabic allomorphs could be used, but that would violate undominated segmental phonotactics ([(maˈdaː-ŋ-l)]).

j. Target: **gumaɽi+CAUSATIVE+PAST** ‘make red-past’ D 90
Winner: (guˈma)(ɽi-ˈŋaː-l)
Rivals: *(guˈma)(ɽi-ˈŋaː-l)-ɲu, *(ˈguma)(ˈɽi-ŋ-l-ɲu)
The even-syllable target forces the [-ːl] allomorph of the past.

Forms with Antipassive

k. Target: **buga+ANTIPASSIVE+PAST** ‘eat-antipassive-past’ D 218
Winner: (buˈgaː)(-dʲi-ˈna)
Rivals: *(ˈbuga)(-ˈdʲi-na), *(buˈgaː)-dʲi-n, *(ˈbugaː)(-ˈdʲi-na), *(buˈgaː)(-ˈdʲi-na)
Prelengthening [-ːdʲi] forces iambic stress. Ranking: LONG ANTIPASSIVE >> *Vː and TROCHAIC DEFAULT. Further, iambic stress in one foot forces iambic stress in the other: *(buˈgaː)(-ˈdʲi-na) because UNIFORMITY >> TROCHAIC DEFAULT.

l. Target: **wuŋaba+ANTIPASSIVE+DATIVE SUBORDINATE**
‘hunt-antipassive-dative subordinate’ D 218
Winner: (ˈwuŋa)(ˈbaː-dʲi)(-ˈɲu-nda)
Rivals: *(wuˈŋa)(ba-ˈdʲiː)(-ˈɲuː-n), *(wuˈŋa)(ba-ˈdʲiː)-ɲuː-n,
*(ˈwuŋa)(ˈba-dʲi)-(ˈɲu-nda)
Prelengthening [-ːdʲi] forces a H L trochaic foot. Ranking: LONG ANTIPASSIVE >> *H L TROCHEE.

m. Target: **wuŋaba+ANTIPASSIVE+PURP.** ‘hunt-antipassive-purposive’ D 218
Winner: (wuˈŋa)(ba-ˈdʲiː)-na
Rivals: *(ˈwuŋa)(ˈbaː-dʲi)-na, *(ˈwuŋa)(ˈbaː-dʲiː)-na, *(wuˈŋa)(baː-ˈdʲiː)-na,
*(wuˈŋa)(ba-ˈdʲiː-n), *wu(ŋaˈbaː)-(dʲi-ˈna)
PENULTIMATE LENGTHENING forces a long vowel in [-dʲiː]. Since feet cannot contain two long vowels, and the allomorph [-ːdʲi] would force length in the preceding syllable, the alternate allomorph [-dʲi] therefore appears instead. Thus the ranking PENULTIMATE LENGTHENING >> LONG ANTIPASSIVE. The final rival candidate is an attempt to subvert the contradiction with non-left-aligned feet; since this candidate is ill-formed, we learn that ALL FEET LEFT >> LONG ANTIPASSIVE. ALL FEET LEFT is in fact undominated.

n. Target: **wuŋaba+ANTIPASSIVE+PAST** ‘hunt-antipassive-past’ D 218
Winner: (wuˈŋa)(ba-ˈdʲiː-ɲ)
Rivals: *(wuˈŋa)(baː-ˈdʲiː-ɲ), *(ˈwuŋa)(ˈbaː)(-ˈdʲiː-ɲ), *(wuˈŋa)(ba-ˈdʲiː)-ɲu,
*(ˈwuŋa)(ˈbaː-dʲiː-ɲ)

Same as previous example, except that length on [-dʲiː] is forced this time by the prelengthening past allomorph [-ːɲ], which is itself forced by the even-syllable target.

o. Target: **buga+ANTIPASSIVE+DATIVE SUBORDINATE**
‘eat-antipassive-dative subordinate’ D 218
Winner: (buˈgaː)(-dʲi-ˈnuː-n)
Rivals: *(buˈgaː)(-dʲi-ˈnuː-n)da, *(ˈbuga)(-ˈdʲi-nu-n)
Prelengthening [-ːdʲi] and the even-syllable preference for the short Dative Subordinate allomorph [-ɲuːn] together enforce iambic feet throughout.

Impossible Verb Type

p. Target: **xawa**ː**+PRESENT** (hypothetical lexical representation)
Winner: (ˈxawa-l)
Rival: *(xaˈwaː-l)
Vowel length is not phonemic in verbs; thus *Vː forces an all-short outcome, even if a hypothetical lexical representation (“[xawaː]”) requests it. Ranking: *Vː >> IDENT([LONG]).

This entire set was annotated for its violations of the 47 constraints laid out above. It was then submitted to constraint-ranking software, written by the author, which implements the Constraint Demotion ranking algorithm of Tesar and Smolensky (1993, 1996). This program established a set of constraint rankings that obtained the correct results.[26] More precisely, the program produced the normal output of the Constraint Demotion algorithm: a ranked set of constraint *strata*, such that any complete ranking of the constraints that is compatible with their stratal memberships will generate the correct outcomes. The program also generated tableaux for all input-output pairs, from which the ranking arguments given above were taken.

Actually, not just one ranking was obtained, but four: one for the “standard” pattern of Stem Vowel Restoration outlined in (11), and one for each of the three “alternative” strategies described in section 7. For the latter, since Dixon’s documentation covers only a few representative cases, I had to include invented outcomes in the simulation, designed to follow Dixon’s prose description.

The tableaux generated were voluminous (over 35,000 cells total) and cannot be listed here. They are available for inspection, however, from the author’s Web site.[27]

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[26] The use of software seemed essential in a simulation of this size: it would have been difficult to detect hidden traps or inconsistencies reliably with hand ranking.

[27] Currently http://www.humnet.ucla.edu/humnet/linguistics/people/hayes/hayes.htm.

For an adequate Optimality-theoretic grammar of any size, a very large number of assignments of constraints to strata will work empirically. The Constraint Demotion algorithm always selects one particular assignment, namely the one that places every constraint in the highest stratum compatible with the data. For purposes of clear exposition, however, I altered the stratal assignments[28] until I had obtained a stratum set that was equally accurate but could be better understood by inspection than the algorithmically-obtained stratum sets could. The strata I devised were meant to show that the free variation in Yidiɲ is not the result of four vastly different grammars joined together arbitrarily, but of only a few, quite minor cases of free rankings located within a single, coherent overall ranking pattern.

Here is the constraint ranking in its broad outlines. The blocks labeled **Stratum #2** and **Stratum #4** are the parts of the hierarchy that must be allowed to vary in order to produce the cases of free variation.

(54) **General Strata, Common To All Outcomes**

Stratum 1

FOOT BINARITY	(28a)
ALL FEET LEFT	(28b)
UNIFORMITY	(28d)
WEIGHT-TO-STRESS	(28f)
SEGMENTAL PHONOTACTICS	(section 11.3.2)
PENULTIMATE LENGTHENING	(32)
MAX(SEG)	(30)
IDENT(VOWEL QUALITY)	(42)
PU(VOWEL QUALITY)	(47c)
PU-MAX(SEG)	(47d)
STEM-PENULTIMATE SHORTENING	(37b)
/A/ RESTORATION	(45)

STRATUM 2 (variable; see below)

Stratum 3

BAN ON STRAYS	(28c)

STRATUM 4 (variable; see below)

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[28] I did this by imposing particular *a priori* rankings on the constraints, which the algorithmic ranking was then forced to respect. The results, at each stage, were kept only where all of the outcomes continued to be derived correctly.

Stratum 5	
SHORT ERGATIVE	(26)
POSTCONSONANTAL ERGATIVE	(26)
SHORT GENITIVE	(26)
LONG GENITIVE	(26)
SHORT ABLATIVE	(26)
LONG ABLATIVE	(26)
DATIVE	(26)
PURPOSIVE	(27)
SHORT DATIVE SUBORDINATE	(27)
LONG DATIVE SUBORDINATE	(27)
SHORT ANTIPASSIVE	(27)
LONG ANTIPASSIVE	(27)
SHORT CAUSATIVE	(27)
LONG CAUSATIVE	(27)
SHORT L-CONJUGATION PAST	(27)
LONG L-CONJUGATION PAST	(27)
SHORT N-CONJUGATION PAST	(27)
LONG N-CONJUGATION PAST	(27)
Stratum 6	
*H L TROCHEE	(36)
LONG ERGATIVE	(26)
Stratum 7	
IDENT([+LONG]) IN NOUNS	(35)
Stratum 8	
*Vː	(35)
TROCHAIC DEFAULT	(28e)
Stratum 9	
SPREAD RIGHTWARD-first violation	(40)
PU([+LONG])	(47a)
PU([-LONG])	(47b)
IDENT([LONG])	(33)

The rankings implied by these general strata are consistent with all of the individual rankings mentioned earlier. Some notes on the rankings:

- Virtually all the morphological constraints occur together in the same stratum, namely Stratum 5.[29] The constraints of this stratum are outranked by the BAN ON STRAYS, which largely governs allomorph choice.

[29] The one morphological constraint outside Stratum 5 is LONG ERGATIVE. In the present analysis, it must be dominated by POSTCONSONANTAL ERGATIVE, because [-du] is attached to consonant stems even when attaching [-ŋgu] would obey the segmental phonotactics: [wagaːl-

- The other phonotactics that govern allomorphy are the highly-ranked metrical constraints of section 11.3.1, which prevent long vowels from occurring in both odd and even syllables. In the present account, these block prelengthening when a length pattern that cannot be properly parsed metrically would result (see Dixon 227-232 and Crowhurst and Hewitt for extended discussion).[30]

- On the other hand, those constraints of Stratum 5 that require prelengthening suffixes dominate various quite weak constraints (*H L TROCHEE, *V:, and PU[-LONG])) that resist lengthening.

All of the free variation occupies Strata 2 and 4. The four patterns of vowel restoration, occurring in free variation, result from the following inner arrangements of these strata:

(55) **Contents of Variable Stratum 2**

a. "**Standard" Outcomes, Suffix Vowel Copy, and Schwa Insertion** (see sections 5, 7.1, and 7.2)

Stratum 2A

VOWEL RESTORATION	(38)
CV:C SHORTENING	(37a)

Stratum 2B

PU-DEP(SEG)	(48)

b. **Non-alternating Pattern** (see section 7.3)

Stratum 2A

PU-DEP(SEG)	(48)

du], *[waga:l-ŋgu] 'wife-ergative', even though [lŋg] is a permissible medial cluster (D 35, 127). It would probably be feasible to put LONG ERGATIVE back into Stratum 5 by adding to the grammar a violable ban on triple clusters, which would rule out *[waga:l-ŋgu] even if POSTCONSONANTAL ERGATIVE didn't dominate LONG ERGATIVE . This proposal was not implemented, since my software limited the size of the constraint inventory and the point seemed a minor one in any event.

[30] In Dixon's original analysis, pre-lengthening applies freely, with a rule to trim back the excess when an illegal length configuration would be eliminated. What is truly remarkable is how little this rule has to apply. Most of the recalcitrant prelengtheners are deployed by the morphology with exquisite sensitivity to the length-conflict problem. Indeed, what eventually emerges is that there is one and only one possible length conflict: that between the length induced by the antipassive suffix [-:dʲi] and other sources.

Stratum 2B

VOWEL RESTORATION	(38)
CVːC SHORTENING	(56a)

(57) **Contents of Variable Stratum 4**

a. **“Standard” Outcomes**

Stratum 3A

POSTNASAL [U]	(39)

Stratum 3B

SPREAD RIGHTWARD-second violation	(40)

Stratum 3C

SPREAD LEFTWARD	(43)
VOWELS ARE SCHWA	(44)

b. **Suffix Vowel Copy** (see section 7.1)

Stratum 3A

SPREAD LEFTWARD	(43)

Stratum 3B

VOWELS ARE SCHWA	(44)
POSTNASAL [U]	(39)
SPREAD RIGHTWARD-second violation	(40)

c. **Schwa Insertion** (see section 7.2)

Stratum 3A

VOWELS ARE SCHWA	(44)

Stratum 3B

SPREAD LEFTWARD	(43)
SPREAD RIGHTWARD-second violation	(40)
POSTNASAL [U]	(39)

d. **Non-alternation** (see section 7.3)

Stratum 3

SPREAD LEFTWARD	(43)
SPREAD RIGHTWARD-second violation	(40)
VOWELS ARE SCHWA	(44)
POSTNASAL [U]	(39)

Inspecting these micro-strata, it emerges that the re-rankings that relate them are straightforward. Taking the "standard" outputs as our starting point, we can say the following: (a) The free variants with suffix vowel copying are derived under a ranking that moves SPREAD LEFTWARD higher in the hierarchy than the erstwhile active POSTNASAL [U] and SPREAD RIGHTWARD (second violation), within variable Stratum 4. (b) The variants with [ə] as the restored vowel are likewise derived by promoting VOWELS ARE SCHWA to a position above POSTNASAL [U] and SPREAD RIGHTWARD (second violation). (c) Finally, the (marginally acceptable) variants without alternation result from a promotion within Stratum 2, whereby PU-DEP(V), which bans insertion, is moved higher than VOWEL RESTORATION.

The basic conclusions of this section is simply that the analysis works, at least as far as the machine ranking can tell us, and that the free variation reflects minor rerankings, not major overhauls of the system.

Lastly, it should be remembered that this analysis is a partial one in many respects. Most notably, for reasons of time and space I have not taken on the task of projecting bare absolutive stems from their various affixed forms, though I have assumed that this sort of "overcharacterization" does indeed form part of the grammar (section 9.4). To carry out this extension of the analysis will require more example forms, more constraints, and (as it happens) improved software. However, since the extension would simply parallel the well-understood traditional "outside-in" account of Yidiɲ, it should in principle be feasible.

13. Missed Generalizations?

At this point, however, it is time to defend the analysis as it stands against charges that it misses generalizations that are captured under the traditional account, which derives all surface forms from unique underlying representations.

(a) *The status of suffixes as prelengthening or not status of suffixes is predictable: only suffixes that are truncated from longer base forms are prelengthening.*

The correct reply here is simply to deny the premise. Yidiɲ has several suffixes, listed in (5), that are prelengthening, but are not truncated. It also has a suffix allomorph, namely ablative [-m], which to all appearances is the truncated allomorph of the full ablative suffix [-mu], but is not prelengthening. Further, the regular locative suffix allomorph for even-syllabled bases is simply [-ː] (pure prelengthening), and is not derivable from its allomorphic partner [-la], other than with an /l/-deletion process which would have to be limited to a single morpheme. There is really nothing to predict as far as the prelengthening status of affixes goes, since by now the old historical correlation has been quite disrupted.

(b) *The pervasive basis for allomorphy in Yidiɲ, odd/even syllable count, is not accounted for in the proposed analysis.*

This is simply false. The basis in question is the result of the basic metrical structure constraints, along with the BAN ON STRAYS. The allomorphic constraints are stated without any metrical context, because the deployment of the allomorphs can be determined entirely by the higher-ranking metrical constraints.

In other words, whatever is truly general about Yidiɲ phonology, for example, its strong preference for even-syllabled words, its regular stress pattern, and its substantial restrictions on the distribution of long vowels, is embodied in the appropriate metrical constraints. The massive lexical idiosyncrasy in how (and how far) these targets are achieved, is here the property of suffixal constraints; in essence, of the suffixes' lexical entries. Since the suffixes show great idiosyncrasy in their patterning, this is appropriate.

(c) *The proposed system treats as suffix allomorphy that which is plainly derivable by phonology.*

What is at issue here is how regular the system of final truncation really is, and to what extent allomorphy is needed under any account. Here is a quick run-through of the facts.

(i) The full set of suffix pairs that may be related in a completely uncontroversial way by the process of Final Syllable Deletion is the following:

(58)	[-ɲa] ~ [-ːɲ]	accusative
	[-yi] ~ [-ːy]	nominal comitative
	[-ɲu] ~ [-ːɲ]	past ([-n-] conjugation)
	[-ŋa] ~ [-ːŋ]	verbal comitative
	[-ŋa] ~ [-ːŋ]	verbal causative

Only provisionally could the following additional affixes be added, since the alternation involves alternations of consonants with zero as well as vowels. In stems, Final Syllable Deletion never deletes a consonant:

(59)	[-ŋgu] ~ [-ːŋ]	ergative
	[-l-ɲu] ~ [-ːl]	past ([-l-] conjugation)
	[-ɽ-ɲu] ~ [-ːɽ]	past ([-ɽ-] conjugation)
	[-ɲu-nda] ~ [-ɲuː-n]	dative subordinate (verbal)

(ii) The set of allomorphic pairs that alternate in the same way, but cannot be phonologically related (at least without further apparatus), are as follows:

(60)	[-la] ~ [-ː]	locative	(loss of /l/ needs explanation)

[-mu] ~ [-m]	ablative	(lack of prelengthening needs explanation)
[-ni] ~ [-ːn] ~ [-ni] ~ [-nɔ]	genitive	(vowel alternations need explanation)

To these should be added the cases of (3b), repeated below, which must be counted as outright exceptions to the rule.

(61)	[-nda]	dative (nominal)
	[-na]	purposive
	[-n-dʲi], [-l-dʲi], [-ɽ-dʲi]	'lest' inflection (in [-n-], [-l-], and [-ɽ-] conjugations)

Thus the case that these alternations must necessarily be the result of regular phonology is doubtful in any event. In a way, the burden of proof is on the view that suffix alternations should be treated by a regular process: after all, these alternations descend historically from sound changes (probably, the slow phonetic erosion of final vowels in stray syllables, with ultimate restructuring to full deletion as the process reached a critical point). In a way, it is quite striking how irregular the system is that emerges from the sound changes. It is not at all clear that Yidiɲ speakers found this much allomorphy to be uncomfortable.

If it really is a synchronic reality that the suffix allomorphs tend to resemble one another despite the numerous divergences, a possible move to make would be to impose (rather loose) Paradigm Uniformity constraints on the suffix system itself. Such constraints would be hard to verify or disconfirm: evidence on the generalizations that speakers internalize about the suffix system is hard to obtain, since the suffixes form a closed system which cannot be probed with questions about how novel forms would appear.

14. Conclusions

To conclude, I will list what I think one learns from, or at least what is suggested by, the morphophonemic system of Yidiɲ. These conclusions can be divided into two groups: first, those derived fairly directly from the data patterns; and second, the rather less direct theoretical conclusions.

A great virtue of Dixon's original work was that he recognized the inherent interest of the patterns of "vowel restoration" found in Yidiɲ nouns (even though the theory of the time provided no tools for the analysis of this pattern), and thus documented it very thoroughly. What emerged from the reexamination of these data, pursuing a hunch of Dixon's, was that the suffixed forms of truncated Yidiɲ nouns are indeed almost entirely predictable, under general principles, from the form of the isolation stem. As the historical evidence shows, the principles of full-stem projection arose from a massive restructuring of the system, carried out by native speakers after the time that the historical sound change of Final Syllable Deletion was completed. I argued that for various reasons, attempts to characterize the restructuring in orthodox terms, that is, with constraints on underlying representations, are untenable.

From the reanalysis, I concluded a number of general theoretical points:

- The reanalyzed phonology is a clear case of productive, regular alternation that is not driven by phonotactics.

- Yidiɲ is a good example of the favoritism in phonology for the "inside out" projection of forms, argued for in Hayes (1995b), Kenstowicz (1996), and earlier work.

- The constraints needed to accomplish this "inside out" projection are unlikely to be basic principles of UG; rather, they arise as the product of language acquirers' serious need to project novel members of the paradigm under circumstances of limited input data.

- It appears, at least provisionally,[31] that there exist productive principles in Yidiɲ that project isolation forms from suffixed forms, **and** vice versa. If this is correct, then the degree of predictability among paradigm members in Yidiɲ exceeds that which can be attained by the currently normal method, namely the derivation of all surface forms from a single underlying form.

The above points are to some extent framework-independent; for example, they would hold even in non-Optimality-theoretic phonology.

Attempting to obtain an explicit analysis that does justice to the Yidiɲ pattern, I have made two theoretical suggestions:

- A new constraint type, Anticorrespondence, was proposed as a means of deriving alternations that are not phonotactically driven. I conjecture that Anticorrespondence typically arises through historical restructuring processes, since this is likely to be the most common source of non- phonotactically-driven alternation.

- I attempted to develop an appropriate response to an apparently true fact about Yidiɲ, namely that unitary underlying forms do not suffice to capture the full set of predictability relations among forms. The response, inspired by Flemming (1995), consists of a phonology without underlying forms, which relies on Paradigm Uniformity and Anticorrespondence, rather than unitary underlying representations, to establish the relations of predictability among the members of a paradigm.

The particular analysis executed within these basic assumptions was laid out and checked by algorithm.

Plainly, it is the proposal to eliminate underlying representations that is the most radical here; the rest of the analysis could in fact be converted fairly easily into an orthodox one based on uniform underlying representations. Yet the issue of underlying representation in Optimality Theory strikes me as sufficiently problematic that it seems worth putting an alternative proposal

[31] Recall that a crucial data point, namely whether Yidiɲ speakers could productively project truncated isolation forms from suffixed forms, was not elicited (or at least not published) by Dixon, and can only be (rather plausibly) conjectured on the analogy of other languages.

on the table, in hopes of encouraging other researchers to pursue similar approaches for other languages.

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